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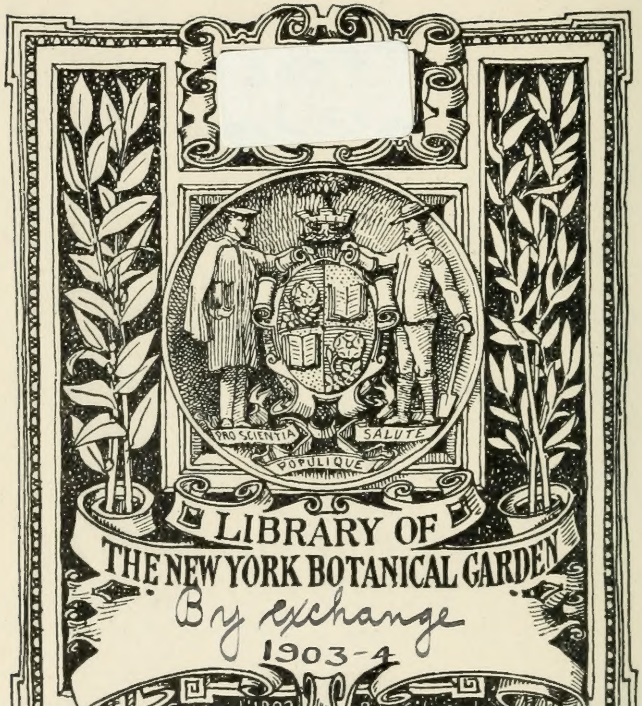
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CONTRIBUTIONS TO BIOLOGY

FROM

THE HOPKINS LABORATORY OF BIOLOGY

I

THE FISHES OF SINALOA

BY

DAVID STARR JORDAN,

President of the Leland Stanford Jr. University,

Assisted by Edwin Chapin Starks, George Bliss Culver
and Thomas Marion Williams.

Leland Stanford Jr. University,
Palo Alto, California,
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(Reprint from the Proceedings of the California Academy of Sciences, Series 2, Vol. V.)

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PREFATORY NOTE.

This memoir is the first of a series designed to illustrate the biological investigations and explorations undertaken by the Hopkins Biological Laboratory, a branch of the Leland Stanford Jr. University, under the especial patronage of Timothy Hopkins, Esq., of Menlo Park, California. The present paper is published with the cooperation of the California Academy of Sciences. It appears simultaneously in its present form and as part of the proceedings of the Academy.

CHARLES H. GILBERT,
OLIVER P. JENKINS,
Editors.

Date of publication, September 7, 1895.

THE FISHES OF SINALOA.*

BY DAVID STARR JORDAN,

Assisted by

EDWIN CHAPIN STARKS, GEORGE BLISS CULVER AND THOMAS MARION WILLIAMS.

[With Plates xxvi–lv.]

The Mexican State of Sinaloa lies along the east shore of the Gulf of California, mostly to the north of the Tropic of Cancer, extending from Rio Fuerte on the north, which separates it from Sonora, to the northwest boundary of Jalisco. The greatest length of the State along the coast is about 325 miles. The land forms an irregular and broken slope from the high table-lands and cliffs of the Sierra Madre on the east downward to the coast. Down this slope flow several streams of clear water, which acquire great volume in the rainy season (June to November) and which dwindle rapidly in the dry season of the winter. The coast line is very irregular, being formed of rocky islands, mostly of volcanic origin, and of abrupt cliffs or "rincones," the terminations of hills or spurs from the Sierra Madre. Between these are long curved sand beaches, and occasionally sand-spits across the mouth of some estuary which is thus converted into a lagoon. The water of the sea off the coast is very clear. The bottom is very irregular, as is the contour of the shore.

The chief port of Sinaloa is Mazatlan. This city of about 20,000 inhabitants lies on a peninsula between the Estuary or Astillero de Mazatlan on the south and a curving bay known as the Puerto Viejo on the north. On this peninsula are two considerable headlands, Nevería on the north and Vijía on the southwest, between which is a sand beach, facing the west, noted for its high surf, for which it is named las Olas Altas. North of Puerto Viejo, at a distance of about seven miles, are three large rocky islands, very much alike, close together and in a right line, known as the three Venados. Opposite them on the shore is a similar headland, Camarron. About all these headlands and islands are many rock-pools and basins left filled with water by receding tides. Beyond the extremity of Vijía is a tall conical island, over 500 feet in height, known as Creston. This is surmounted by a lighthouse and is the most conspicuous land mark of the harbor of Mazatlan. North of Creston lie a number of large barren rocks of white volcanic rock, known collectively as Islas Blancas. The scanty harbor of Mazatlan lies to the south of Vijía and Creston, between these and the Isla de los Chivos and Isla de las Piedras. It ends in a long deep winding channel, known as the Astillero or Estuary, which extends around the south side of the city, with many muddy arms lined with Mangrove bushes, then turns to the south, forming for some ten miles the narrow channel between Isla de las Piedras and the mainland. No fresh waters of importance flow into the Astillero and the tides form strong currents as the waters pass in and out.

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* Contributions to Biology from the Hopkins Seaside Laboratory of the Leland Stanford Jr. University. No. 1.

At Altata, in the northern part of Sinaloa, is a small harbor, the port of the capital City of Culiacan.

Of the several rivers in the State, only one, Rio Presidio or Rio de Mazatlan, was visited by us. This is a swift clear stream, rising in the mountains. At Presidio and Villa Union, where it was visited by us, it flows rapidly over gravel, being in January some three rods wide and rarely more than two feet deep.

The fishes of Sinaloa are known chiefly from the collections made by Dr. Charles H. Gilbert in the winter of 1881. Under the auspices of the U. S. Fish Commission, Mr. Gilbert spent six weeks at Mazatlan where he secured a collection of about 180 species, of which number about fifty were new to science. These were described by Jordan and Gilbert in the Proceedings of the U. S. National Museum in 1881, the typical specimens being deposited in the Museum at Washington. Previous to this time a number of specimens had been sent, by collectors who had visited Mazatlan and Altata, to the Museum at Vienna, where they were described by Dr. Franz Steindachner, and to Berlin where they were recorded by Professor Peters.

Subsequent to the visit of Dr. Gilbert, collections were made at Mazatlan and Presidio by Mr. Alphonse Forrer, now of Santa Cruz, California. Most of these were sent to the U. S. National Museum, where they were described by the present writer. A few specimens were also sent to the British Museum.

In December, 1894, through the kindly interest of Mr. Timothy Hopkins of Menlo Park, California, and under the auspices of the Hopkins Seaside Laboratory, a branch of the Leland Stanford Jr. University, an expedition was sent to Mazatlan for the purpose of collecting fishes. This was in charge of David S. Jordan, assisted by George B. Culver and Edwin C. Starks. In addition, Mr. Thomas M. Williams, Mr. Norman B. Scofield and Mr. James A. Richardson accompanied the expedition as volunteer assistants, with Frank H. Lamb as botanist, and Mr. George B. Seward as herpetologist.

One month, Dec. 24, 1894 to Jan. 25, 1895, was spent at Mazatlan in the collection of fishes. One hundred and eighty-five species were obtained, of which twenty-nine seem to be new to science, besides two species from La Paz. A full series of the specimens obtained is in the Museum of Leland Stanford Jr. University. Other series nearly complete have been sent to the British Museum and to the Museums at Vienna and Berlin. Partial sets are in the Academy of Sciences at San Francisco and in the U. S. National Museum. It is evident that the list here given is by no means a complete record of the fishes of Sinaloa. Doubtless all the species enumerated from Sonora by Gilbert, Jenkins and Evermann, and by Gilbert and others from Lower California, will ultimately be found in this region. Every day spent at Mazatlan either by Dr. Gilbert or by ourselves brought some addition to the list, and the deep water fishes have not been studied at all.

Besides our obligations to Mr. Hopkins, and to the volunteer assistants above named, the writers wish to express their especial indebtedness for local assistance to Dr. George Warren Rogers, a scholarly physician resident at Mazatlan; to Señor Ygnacio Moreno, the leading fisherman of the port, whose efforts in aiding our work were unwearying. We also owe many favors to Messrs. William W. Felton, Bert L. Smith, John L. Kendall and J. Rippey, American residents in Mazatlan. From Dr. Charles H. Gilbert, in whose laboratory the present paper has been written, we have received much valuable aid in many ways.

The plates accompanying this paper have been drawn by Miss Anna L. Brown, artist of the Hopkins Laboratory.

The following species are here described as new to science. The numbers after each name are those borne by the type specimens on the register of the Museum of Leland Stanford Jr. University.

Pristis zephyreus Jordan & Starks. (Skin.)
Narcine entemedor Jordan & Starks. 1699.
Urolophus rogersi Jordan & Starks. 1700.
Urolophus umbrifer Jordan & Starks.
Pteroplatea rava Jordan & Starks. 1587.

Galeichthys gilberti Jordan & Williams. 1666, 1667, 1668.
Galeichthys azureus Jordan & Williams. 1575.
Stolephorus scofieldi Jordan & Culver. 2941.
Pœcilia presidionis Jordan & Culver. 2687.
Siphostoma starksii Jordan & Culver. 2686.
Mugil hospes Jordan & Culver. 2890, 2954, 1695.
Thyrina evermanni Jordan & Culver. 2688.
Thyrina crystallina Jordan & Culver. 2685.
Scomberomorus sinaloæ Jordan & Starks. 1720.
Caranx medusicola Jordan & Starks. 2645.
Hynnis hopkinsi Jordan & Starks. 1563.
Trachinotus paloma Jordan & Starks. 2690.
Trachinotus culveri Jordan & Starks. 2691.
Mycteroperca venadorum Jordan & Starks. (British Museum.)
Mycteroperca boulengeri Jordan & Starks. 1621.
Lythrulon opalescens Jordan & Starks. 2963.
Microspathodon azurissimus Jordan & Starks. 1636, 2895, 1610.
Teuthis crestonis Jordan & Starks. 2899.
Balistes naufragium Jordan & Starks. 1656.
Aboma etheostoma Jordan & Starks.
Gobius manglicola Jordan & Starks. 3095.
Scorpæna mystes Jordan & Starks. 1616, 1617, 2919, 1501.
Symphurus williamsi Jordan & Culver. 2943.
Orthopristis reddingi Jordan & Richardson.
Alexurus armiger Jordan & Richardson.

Family GINGLYMOSTOMIDÆ.

1. **Ginglymostoma cirratum** (Gmelin.) GATA.

Two large specimens, respectively five and six feet in length, were taken. These agree fairly with published descriptions, except that the black spots scattered over the body are very small and pepper-like. It is possible that these spots vanish with age, and that *Ginglymostoma fulvum* Poey, the unspotted form, is the adult of the other.

This species was obtained by Dr. Gilbert, at Mazatlan and Panama.

Family GALEIDÆ.

2. **Galeus lunulatus** (Jordan & Gilbert). Gato.

Rather common at Mazatlan, where the original types were obtained by Dr. Gilbert.

3. **Galeocerdo tigrinus** Müller & Henle.

Recorded by Dr. Gilbert, from Mazatlan and from San José de Guatemala; not seen by us. It has not been compared with the Brazilian type of the species.

4. **Scoliodon longurio** (Jordan & Gilbert).

Rather common in the harbor at Mazatlan, where the original types were taken by Dr. Gilbert, who also found the species at Panama.

5. **Carcharhinus æthalorus** Jordan & Gilbert.

Original described from Mazatlan; not seen by us. Also recorded by Dr. Gilbert, from Panama. It is not likely that *Carcharhinus limbatus* occurs on the Pacific Coast. Probably this related species has been mistaken for it.

6. **Carcharhinus lamiella** (Jordan & Gilbert).

A very young specimen with a deformed tail was obtained by us at Mazatlan, the first record of the species from that port.

7. **Carcharhinus fronto** Jordan & Gilbert.

This large shark is not uncommon about Mazatlan, where the original types were taken by Dr. Gilbert. No specimens were seen by us, but the species is said to be common in the surf about the Olas Altas. It is said that during the time that Mazatlan was occupied by French soldiers a number of these were killed by the sharks while bathing in the surf.

Family SPHYRNIDÆ.

8. **Sphyrna tiburo** (Linnæus). CORNUDA.

One specimen obtained by us at Mazatlan. It was not secured by Dr. Gilbert: this being the first record on the Pacific Coast of America of this common Atlantic species. Our specimen seems to agree fully with an example from Florida.

9. **Sphyrna tudes** (Cuvier). CORNUDA.

Not rare at Mazatlan, where specimens were obtained by Dr. Gilbert, and one by the Hopkins expedition.

10. **Sphyrna zygæna** Linnæus. CORNUDA.

Common in the sea about Mazatlan. Three young specimens taken by us. Also recorded by Dr. Gilbert from Mazatlan and Panama.

Family PRISTIDIDÆ.

11. **Pristis zephyreus** Jordan & Starks n. sp. PEZ DE ESPADA.

Snout to nostrils, 3 in length to base of caudal; breadth of saw at anterior end between first two pairs of teeth half breadth of its base behind the last pairs; teeth on saw trenchant behind, arranged in 22 pairs; hinder teeth wide apart, the interspaces 5 times their base; posterior teeth turned slightly backward, a groove on their posterior edge; front teeth not quite half as long as the saw is broad at their base; distance between first and second tooth three times base of first. (Other specimens examined for us by Dr. G. W. Rogers show 18 to 21 pairs of teeth.) Eye equal to spiracle, contained 3 times in base of saw just behind last pair of teeth; width of mouth a little greater than base of saw; mouth with about 65 series of blunt teeth; slant height of pectoral in front, a little more than half distance from tip of snout to mouth. Dorsals sub-equal; first dorsal inserted in advance of ventrals; about half its base over ventrals; caudal, with a lower lobe, which is equal to slant height of pectoral; tail with a keel on side.

Color, plain olive grey above, light below.

Measurements—Length, 50 inches; caudal, 7 inches; pectoral, 7 inches; dorsal front, 5½ inches; snout without nostril, 11 inches.

Type—A skin in L. S. Jr. Univ. Museum.

Common in brackish waters at the mouth of the Rio Presidio, where one fine specimen was obtained. The species is also recorded (as *Pristis perroteti*) by Dr. Gilbert from Mazatlan, and by Dr. Günther from Chiapam. Dr. Günther identifies this species with *Pristis perroteti* described by Müller & Henle, from the Senegal River. In view of the great difference in the fauna of the Gulf of California from that of Equatorial Africa, this identification may be questioned, especially as there are several details in which the description of *Pristis perotteti* differs from our fish.

We append the description of Müller & Henle, as also the descriptions given by Latham of his *Pristis antiquorum* and *Pristis pectinatus*, together with our account of the common saw fish of the Gulf of Mexico, usually and probably correctly identified as *Pristis pectinatus* Latham.

The following is the original description of

"Spec. 4. Pristis Perotteti, N.

Kopf. "Die Form des Kopfes und der Naslöcher wie Pristis antiquorum. Die Säge läuft nach vorn sehr allmahlig spitz zu. Sie ist an der Basis 1 Zoll 7 Linien, an der Spitze zwischen den beiden letzten Zahnen 10 Linien breit, 19 Zahne jederseits. Die hintersten Zähne sind kurz, wahrscheinlich abgenutzt. Die vordersten sind etwas breiter als die Halfte der Breite der Säge, alle am hintern Rande gerinnt. Die hintern Zahne stehen weit aus einander, um 5–6 Mal die Breite des Zahns. Die vordersten sind einander etwas mehr genahert. Die Distanz zwischen den beiden letzten ist nicht ganz 3 Mal so breit als die Basis des Zahns. Alle Zahne nur wenig nach hinten geneigt.

"Die obere Nasenklappe reicht mit ihrem innern Rande bis zum innern Nasenwinkel. Die Zahne sind grösser als bei Pristis antiquorum, 60-70 in einer Reihe.

Flossen. Die Brustflossen vom Kopf scharf abgesetzt. Erste Ruckenflosse mit der Halfte ikrer Basis vor den Bauchflossen. Schwanzflosse mit kurzem aber deutlichem untern Lappen.

Farbe. Farbe wie *Pristis antiquorum*.

Maasse. Von der Spitze der Säge zur Mitte zwischen den

"aussern Naswinkeln	11″	6‴
Von den Naslöchern zum Maul	1″	10‴
Vom Maul zum After	11″	
Vom After zur Schwanzflosse	8″	
Lange der Schwanzflosse	5″	6‴
Breite der Säge in der Mitte	1″	2‴
Lange des Langsten Zahns		6‴
Breite desselben		1½‴
Distanz der Naslöcher	2″	
Breite des Maules	2″	

Fundort. Aus dem Senegal. Soll nur im sussen Wasser leben.
Ein Exampler ♂ trocken in Paris durch Perottet."
(Müller & Henle, Plagiostomen, p. 108.)

From the work of Latham we take the following description of his

"Pristis antiquorum:

Pr. rostro spinis validis utrinque 18–24. Tab. 26, f. i.

Squalus pristis, Lin. Syst. Nat. I., p. 401, 15. Faun. Suec. 297. Mus. Ad Fr. I., p. 52. Mull. Lin. Th. 3, Tab. ii, f. 2 (spin. 18). Gmel. Lin. I., p. 1494, 15. Fab. Fn. Groenl., 130, 91, Mull. Prodr., p. 38, 319. Klein. Miss. Pisc. 3, p. 12, No. ii, tab. 3, f. 1, 2. (pullus.)

Plin. Nat. Hist., lib. 9, cap. 2. Clus. Ex., tab. 14, p. 136 (spin. 20). Aldrov. Cet., p. 692. Will. Icth., p. 61, Tab. B. 9, fig. 5 (fig. Clusii). Raii, Syn. Pisc., p. 23. Olear. Mus., p. 41, t. 26, f. i. Rondel. Pisc. 487.

Bell. de Aq., t. in p. 66 (Langue de Serpent).

Valent. Amboin, p. 33, t. 19, f. 52. Bloch, Fisch. Deutsch., p. 37, t. 120. Du Tertre Ant., p. 207 (Spadon). Bonann. Mus. Kirch., t. 288, t. 21. Cabinet de Ste. Genev., t. p. 100. Brouss. Act. Par. 1780, p. 671. (La Scie.) Pis. Ind. Occ., p. 51. Marcgr. Bras., p. 158 (Araguagua). Gronov. Zooph., p. 33. Arted. Syn. 66, Id. Syn. 93. Brown. Jam. 458, I.

HABITAT IN OCEANO.

"Totum corpus ad 15 pedes longum, supra nigricans, seu leucophæo-griseum, abdomine albicante. Caput antice planum. Rostrum ad 5 pedes longum, spinis validis numero utrinque 18-24. Os dentibus granulatis instructum. Oculi magni iride aurea. Pone oculos foramina duo oblonga. Spiracula quinque. Pinna dorsalis prima ventralibus opposita, altera inter primam & caudæ apicem media. Pectorales latæ longæque. Caudalis brevior quam congeribus.

This species and the following grow to the largest size of any which have yet come under the inspection of the naturalist, some specimens measuring 15 feet in length.

The head is rather flat at top, the eyes large, with yellow irides, behind which is a hole, which some have supposed may lead to an organ of hearing.*

The mouth is well furnished with teeth, but they are blunt, serving rather to bruise its prey than to divide it by cutting. Before the mouth are two other foramina, supposed to be the nostrils. The rostrum, beak or snout, is in general about one-third of the total length of the fish, and contains in some eighteen, in others as far as twenty-three or twenty-four spines on each side; these are very stout, much thicker at the back part, and channelled, inclining to an edge forwards. The fins are seven in number, viz.: two dorsal, placed at some distance from each other; two pectoral, taking rise just behind the breathing-holes, which are five in number; two ventral, situated aimost underneath the first dorsal; and lastly the caudal, occupying the tail both above and beneath, but longest on the upper part. The general color of the body is a dull grey, or brownish, growing paler as it approaches the belly, where it is nearly white." (*Latham*, Trans. Linn. Soc., 1794, p. 277.)

Mr. Latham thus describes his

"Pristis pectinatus:

Pr. rostro spinis angustioribus utrinque ad 34. Tab. 26, fig. 2.

Pristis seu Serra, Gesner Aq., fig. in p. 728 (spin. 34), Id. Ic. An., p. 171. Mus. Besler, tab. 17, f. 3 (spin. 28). Id. f. i (caput, spinis, 25) Aldr. Cet. f., p. 692. Johnst. Pisc., p. 8, t. iii (spin. 28). Blas. Anat., p. 466, t. 49, f. 13. Bloch, Deutsch. p. 37, t. 120 (rostr. arcuat.). Knorr, Delic., p. 56, t. H. 4. Olear. Kunst., p. 38, t. 25, f. i. Pontop. Hist. Norv. ii, p. 240. (spin. 25.)

HABITAT IN OCEANO.

Corpus a priore non multum differt. Rostri spinæ longiores, & minus validæ, numero variant a 25 usque ad 34. Pinnæ posticæ magis excavatæ.

This and the former species have been confounded hitherto by naturalists, nor are we certain that any others have been observed by them; and if we may judge by their figures of each, it should seem that the first described was the most plentiful. That figured in Gesner is far from a bad representation, and the one engraved by Knorr in his Deliciæ is sufficiently accurate. This species differs from the first, in having the snout more narrow in proportion at the base, and the whole of it more slender in all its parts; whereas the first is very broad at the base, and tapers considerably from thence to the point. The spines on each side also are longer and more slender, and vary from 24 to 34 in the different specimens; we have indeed been informed of one which contained no less than 35 spines on each side of the snout; but we must confess that we have never been fortunate enough to have seen such a specimen. This is supposed to grow to as great a size as the former, and in the general make and shape of the body does not materially differ." (*Latham*, Trans. Linn. Soc., 1794, p. 278.)

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* Nos foramina hæc meatus auditorios esse credimus. Willughb.

The following description of *Pristis pectinatus* Latham (*Pristis granulosa* Bloch & Schneider) is taken from a specimen two feet long, from Key West, Fla.:

Snout to nasal-lobes, 3 in length of body to base of caudal; width of anterior end of saw between first two pairs of teeth, equal to the internasal space, ⅔ the base behind last pair of teeth; saw with 26 teeth on a side; eye larger than spiracle, half interorbital space; width of mouth equal to its distance to front of nostril; teeth in mouth in about 70 series; width across outer angle of pectoral fins, 2⅓ in length from eyes to base of caudal; width of body behind pectorals, 7. Height of pectoral slant in front, 3 in snout to mouth; dorsals subequal; caudal, with no lower lobe, equal to pectoral slant.

Color, uniform brown above, below light.

Family RHINOBATIDÆ.

12. **Rhinobatus glaucostigma** Jordan & Gilbert. GUITARRO.

Very common on sandy bottoms in the estuary or Astillero at Mazatlan, where the species was originally found by Dr. Gilbert.

Family NARCOBATIDÆ.

13. **Narcine entemedor** Jordan & Starks, n. sp. ENTEMEDOR.

Two specimens taken in the estuary at Mazatlan, and a third procured by Mr. James A. Richardson in the harbor of La Paz. Specimens had also been obtained by Dr. Gilbert, at Panama, in 1883, but having been destroyed by fire, the species has remained undescribed until the present time.

Snout 3¾ in length of disk; preocular part of snout equals preoral; interocular space in snout, 1½; width of mouth, 2¼. Eye much smaller than spiracle; spiracles edged with small tubercles. Length of disk equal to its width; disk equal to length of tail, without caudal fin; tail with a loose fold of skin on each side. First and second dorsals equal, rounded behind; ventrals large, ending midway between posterior edge of disk and caudal fin. Color: Pale olive brown, a little clouded with darker; second dorsal edged with pale; dots on head dusky.

Length of largest specimen, 20 inches. Type, No. 1699, L. S. Jr. Univ. Mus.

The Spanish name *Entemedor* seems to be equivalent to *Intimidator*.

Family DASYATIDÆ.

14. **Urolophus asterias** Jordan & Gilbert. RAIA.

Very common in the surf and on the sandy beaches about Mazatlan. Spinules on back and tail 18 to 32 in number. The upper side of the disk is marked with round dusky spots, faint, as if washed or faded out.

15. **Urolophus rogersi** Jordan & Starks, n. sp.

Disk broader than long by a distance 2½ times the interorbital width; anterior margins of disk nearly straight, the tip of snout projecting; snout from eye, 3¾ in length of disk; eyes little smaller than spiracles; width of mouth, 2½ times in preoral part of snout; caudal spine inserted in front of middle of tail. Skin with minute prickles on margin of pectorals and on middle of back, leaving smooth areas near middle of pectorals and over branchial arches: 16 to 20 large spinules along median line of back and tail.

Color, plain brown; caudal fin darker, edged with white.

This species differs from *Urolophus asterias*, in having a wider disk, more acute snout, much smaller prickles, and fewer spinules on back and tail.

Three specimens obtained in the Astillero, the longest 18 inches in entire length. Type, No. 1700, L. S. Jr. U. Museum.

This species is named for Dr. George Warren Rogers, a scholarly physician, native of Vermont, but long resident in Mazatlan.

16. **Urolophus umbrifer** Jordan & Starks n. sp.

Occasionally taken with *Urolophus asterias*, but much less common.

Disk round, not wider than long, its length greater than tail; snout pointed, not exserted. Snout from eye, 4½ in disk; eyes equal to spiracles; mouth 2 in distance to tip of snout; caudal spine inserted in front of middle of tail; skin perfectly smooth.

Color, brown above, with blackish cross-shades or bars, radiating from the shoulder; a dark band behind eyes, and one from eyes; caudal fin dark.

One adult female specimen, the uterus containing four young.

This is probably not identical with Garman's *Urolophus nebulosus*, being perfectly smooth and different in color.

17. **Dasyatis longus** Garman.

Rather common at Mazatlan, where specimens were also taken by Dr. Gilbert; also recorded by Mr. Garman from Acapulco and from Panama, and by Evermann & Jenkins from Guaymas.

18. **Pteroplatea crebripunctata** Peters. MANTARAIA.

Very common on sandy shores everywhere about Mazatlan, from which locality it was originally described; also taken by Dr. Gilbert.

Width of disk twice length to posterior end of anal slit; snout forming a regular curve from a little in front of middle of pectorals, a very small blunt projection at tip; anterior margin of disk convex near snout and lateral angles, pectorals concave medially; posterior margin weakly convex; posterior angle broadly rounded; lateral angle sharply rounded; distance from snout to a line drawn through lateral angles, 2½ times in distance to tip of tail.

Interorbital a little wider than its distance to tip of snout; eyes twice spiracles; mouth equals snout, 6½ in disk. Tail rat-like, with a scarcely perceptible fold of skin on its dorsal side.

Ground color olive brown, everywhere with small dark points, not so close set as in *Pteroplatea rava*, indistinct greyish spots, half as large as iris, scattered over the body among the dark points, these spots are more distinct on anterior edge of disk; tail mottled with darker; lower parts light. Markings nowhere so distinct as in the next species.

Several specimens, the largest 15 inches long.

19. **Pteroplatea rava** Jordan & Starks, n. sp. MANTARAIA COLORADA.

One specimen taken in the Astillero at Mazatlan.

Length of disk 1⅔ width; snout forming an angle which is almost a right angle; pectorals slightly concave medially; posterior margin of disk weakly convex; posterior angle not broadly rounded, but curved in somewhat suddenly; lateral angles acute.

A line drawn through lateral angles would bisect a line from snout to tip of tail. Interorbital 1⅓ in snout; eye 1½ in spiracles; mouth 7 in disk, 1½ in snout; tail straight and slender, with a very slight fold on dorsal side.

Ground color light olive brown, thickly set with sharp cut black points; conspicuous grey or white spots, half as large as iris, scattered over the body, around which the black spots form rings; brighter yellowish spots and half spots around anterior edge of disk; tail mottled above with darker; lower parts chiefly light orange red or rust colored in life.

All the markings are very distinct and clear cut, the reddish of the belly conspicuous.

One specimen, 12 inches long. Type No. 1587, L. S. Jr. Univ. Mus.

20. **Ætobatus narinari** (Euphrasen). GAVILAN.

Rather common in the harbor of Mazatlan, where it was also taken by Gilbert; a beautifully colored species reaching a large size.

Length of disk 1⅔ in width; proximal half of anterior margin of pectoral fins straight, distal half convex; posterior margin concave, the end of each ray forming a small scallop; lateral angle sharp.

Snout forming an angle, from its tip to division of nasal-lobes, 1⅓ times breadth of head; width of snout 1⅕ times distance from its tip to the division of nasal-lobes; nasal-lobes projecting back over the mouth; width of mouth 1½ its distance to tip of snout; numerous blunt buccal papillæ around upper dental plate and on ridge between nostrils; interorbital 4¾ in disk; eyes smaller than spiracles, which are as long as base of dorsal. Ventrals well rounded, 3⅔ in length of disk; tail 3½ times disk. First caudal spine equals base of dorsal, which is half second spine.

Color bluish black with many round yellowish spots scattered equally over the back and ventral fins; spots about as large as eye on back, smaller on head, sometimes two spots run together forming an elliptical spot, about sixteen spots from eye along anterior margin of pectoral to lateral angle; posterior margin of pectoral very narrowly margined with white; ventral side pearly white.

From the description of *Ætobatus laticeps* this species differs in the following respects: disk not so broad; tail not so long; width of head and snout less; ventrals not truncated behind; pectorals not margined with blackish; spots on ventrals not assuming the form of ocelli.

Five large specimens obtained; length of disk in each, 15 inches.

This description has been compared by Dr. Barton W. Evermann, with specimens of *Ætobatus narinari* from Brazil. No difference of any importance appears, and in his judgment the Atlantic and Pacific Coast American forms are identical.

NOTE.—This species has been several times obtained by Dr. Gilbert and others in the Gulf of California, having been identified as *Ætobatus laticeps* of Gill. It does not, however, agree with Dr. Gill's description and there is no evidence that his specimen came from Mexico. *Ætobatus laticeps* was described from an example from unknown locality received from San Francisco. It is therefore quite as likely to have come from Honolulu or from China, as from the Gulf of California.

The following is Dr. Gill's description:

"*Aëtobatis laticeps* Gill.

"The greatest width is rather *more* than twice as great as distance from snout to front of anus. The head is broad and nearly equals the distance from snout to division of nasal lobes. The snout is obtusely angulated in front, and at its sides is convex and scarcely angulated;

its width at a line in front of the nostril is as great as the distance from its point to interlobular nasal emargination. The rostro-frontal fontanelle is constricted at its anterior third; the interval between the crests of the anterior portion enters about 2⅔ times in the interorbital area; at the constriction, about 4 times; at the posterior portion, about 2⅔ times; the posterior portion gradually expands backwards and terminates with an oval contour behind. The nasal lobes are about twice as long as wide, their length externally exceeding half the length or breadth of the rostral area.

"The dental plate has a triangular contour; its anterior angle obtusely rounded.

"The dorsal commences immediately behind the pectoral fins. The ventral fins almost truncated behind, between the well rounded angles; their breadth 2½ times their length. The tail is four or five times as long as the body.

"The color is bluish-black above, relieved on the head by numerous, but rather distinct, whitish or yellowish spots, smaller than eye, much larger on the body and behind towards the sides, and on the ventrols sometimes assuming the form of ocelli; below white; pectorals margined with blackish.

"This species is closely related to *A. narinari* and its allies, and especially *A. latirostris* A. Dum., but is apparently distinguished by the combination of characters given in the diagnosis. It belongs to the genus *Goniobatis* Ag., proposed for a species with a more angular lower dental plate than in *A. narinari*, and is related to the *Goniobatis meleagris* Ag.* of the Sandwich Islands, but is distinguished by the more declivous forehead and the shape of the rostro-frontal fontanelle.

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* "This species has not been characterized, but a dried Aëtobatine obtained at the Sandwich Islands by the Wilkes Exploring Expedition probably belongs to it."

"A single specimen was forwarded to the Smithsonian Institution by S. E. Hubbard, Esq., of San Francisco, Cal." (Gill.)

21. **Manta birostris** (Walbaum).

Said to be frequently seen in the open sea about Mazatlan; not obtained by us.

Family SILURIDÆ.

22. **Felichthys pinnimaculatus** (Steindachner).

Occasionally taken in the estuary. Recorded by Gilbert from Mazatlan and Panama, by Steindachner from Altata, Costa Rica and Panama. Two specimens obtained by us.

23. **Felichthys panamensis** (Gill).

Not rare in the estuary, reaching a considerable size. Obtained by Gilbert at Mazatlan, Libertad, Punta Arenas; by Gill and Günther at Panama; and by Steindachner at Magdalena Bay, Altata and Panama. One specimen obtained by us.

24. **Galeichthys peruvianus** Lütken. PANAMA.

Recorded by Steindachner from Altata; not seen by us, and taken by Dr. Gilbert only at Panama; apparently not common.

The so-called genus *Galeichthys* is distinguished from *Hexanematichthys* only by having the bones of the head covered by skin. In several species of other genera (notably *platypogon*, *dasycephalus*, *gilberti*), the skin on the head is thickened in females, obscuring the outline and granulation of many of the bones. It may be that the species called *Galeichthys* represent only the extreme of this condition, and that the species referred to it should be arranged in other groups.

As the dentition of the typical species of *Galeichthys* agrees in essential respects with that of *Hexanematichthys*, we unite the two groups under the earlier name, *Galeichthys*.

25. Galeichthys gilberti Jordan & Williams, n. sp. BAGRE BLANCO. Plate xxvi.

Extremely abundant in the upper part of the Astillero, along sandy bottoms, exceeding by far in numbers all other cat fishes. Also found by Gilbert at Mazatlan, whence it was erroneously recorded by Jordan & Gilbert as *Arius assimilis* Günther. Large numbers of this species are left on the beach after seining, and the various sea birds, pelicans, man-of-war birds, gulls and the like, come down to take possession of them. In two cases specimens of this cat-fish were swallowed by pelicans; the spines were erected after the fish was partly engorged, and these spines entering the skin of the sack of the pelican, made it impossible for the bird to swallow them or to dislodge them. Considerable numbers of pelicans are doubtless destroyed every year by attempting to swallow living cat-fish which have been left by the fishermen.

The following description is essentially that of Jordan & Gilbert, Bull. U. S. Nat. Mus., 1882, under the name of *Arius assimilis*. The type of that description, 29,213 U. S. N. M., from Mazatlan, coll., Gilbert, may be taken as the special type of the species, numerous co-types (numbered 1666, 1667 and 1668, L. S. Jr. Mus.), having been sent by us to different museums:

Head, $3\frac{4}{7}$ to 4; width of head, $5\frac{1}{3}$: depth, 5; D. I. 7; A. 4, 14.

Body comparatively elongate, the head depressed but not very broad, somewhat broader than high; eye rather large, 5 to 6 in length of head; width of interorbital space, 2¼ in head; breadth of mouth, $2\frac{3}{5}$; length of snout, 3.

Teeth all villiform; bands of vomerine teeth separated by a rather wide interval, each small, roundish, confluent with the neighboring palatine band, the junction marked by a slight constriction; palatine bands ovate, broad behind, varying considerably in size and somewhat in form, the width ranging from one-third diameter of eye to two-thirds, being generally largest in adults; band of palatine teeth without backward prolongation; band of maxillary teeth rather broad and short, its length about five times its breadth. Maxillary barbel broad and flattened at base, reaching a little past base of pectoral in the young, scarcely to the gill opening in the adult; outer mental barbels, 2 in head, inner 3. Gill-rakers, 4+12.

Dorsal shield very short, narrowly crescent-shaped, its length on the median line not more than half that of one of its sides. Occipital process subtriangular, not quite as long as broad at base, with a strong median keel, its edges slightly curved. A short distance in front of the beginning of the keel is the end of the very narrow groove-like fontanelle, which is somewhat widened anteriorly, finally merging into the broad, flat, smooth interorbital area, the boundaries of which are not well defined; shields of head usually smooth, all finely and very sparsely granular, the granules not forming distinct lines.

Gill membranes forming a rather broad fold across isthmus.

Dorsal spine long, usually, but not always, shorter than the pectoral spine, about 1¾ in head; axillary pore absent. Humeral process rather broadly triangular, not much produced backward, less than half length of pectoral spine, its surface not granular, covered by skin. Adipose fin half length of anal, its posterior margin little free. Upper lobe of caudal longest and somewhat falcate, about as long as head. Ventrals unusually long about reaching anal in females, shorter in the males. Vent much nearer base of ventrals than anal.

Color olive green, with bluish luster, white below; upper fins dusky olivaceous; caudal yellowish dusky at tip; anal yellowish with a median dusky shade; ventral yellowish, the basal half of the upper side abruptly black; pectorals similarly colored, the black area rather smaller; maxillary barbel blackish; other barbels pale.

Length, 12 to 18 inches.

The following specimens from Dr. Gilbert's Mazatlan collections are registered in the United States National Museum:

28,161, 28,189, 28,210, 28,213 (2), 28,221, 28,232, 28,276, 28,304.

This species is nearest allied to *Galeichthys seemanni* (Günther), a Panama species. *Galeichthys jordani* (Eigenmann) from Panama differs in the gill rakers and in other regards. *Galeichthys assimilis* is an Atlantic species, not yet known from the Pacific Coast. With each of these *Galeichthys gilberti* has been at one time or another confounded. *Galeichthys gilberti* differs from *Galeichthys seemanni*, as described by Dr. Eigenmann, in the absence of pectoral pore, in the shorter spines and in the fontanelle not quite reaching occipital process; ventrals unusually long, no dark specks on side of belly, barbel short, compressed. As noted below, *Galeichthys gilberti* bears a superficial resemblance to *Netuma platypogon*. Its teeth are different, the ventrals are much longer, and the adipose dorsal much larger. *Netuma* *platypogon* has the sides of belly much soiled by dark specks.

26. **Galeichthys azureus** Jordan & Williams, n. sp. BAGRE AZUL. Plate xxvii.

Head $3\frac{1}{4}$; width of head $4\frac{5}{9}$, depth 9. Length from tip of snout to tip of upper lobe of caudal fin $19\frac{1}{4}$ inches. D. I, 7: P. I, 10. A. 4, 14. Gill rakers 6+13.

Body robust, its width anteriorly greater than its depth; caudal peduncle short, stout; distance from end of anal fin to base of median caudal rays about one-half length of head. Head flat, very broad; its depth at posterior angle of jaw about one-half its width; interorbital region flat, smooth anteriorly and granulated posteriorly; fontanelle almost obsolete, wide anteriorly and ending in a short groove posteriorly at a point one-half distance from tip of snout to posterior end of occipital process; top of head, occipital process and dorsal shield finely granular, granulations mostly arranged in radiating striæ and extending forward to a line with the pupils, nostrils very large and close together; posterior one with a broad valve.

Occipital process pentagonal, its length $4\frac{1}{2}$ in head, about as long as wide, with a very low ridge: dorsal shield crescent shaped with points extending back on each side of fin, its median length about one-half the length of its side. Eye small, about 9 in head; interorbital width almost 2 in head; snout 3 in head; breadth of mouth $2\frac{3}{10}$ in head.

Maxillary barbel slender, thick at base, $1\frac{4}{5}$ in head; outer mental barbel reaches to posterior angle of jaw, about $2\frac{3}{5}$ in head; inner mental barbel about 4 in head.

Teeth all villiform; premaxillary band narrow, about one-eighth as wide as long, vomerine and palatine bands of teeth fully confluent on each side, forming together a crescent-shaped patch, narrowly divided on the median line of the vomer: form of vomerine bands similar to that of the palatine bands but smaller. Palatine band of teeth without backward prolongations.

Opercle with radiating ridges: humeral process granular, triangular, lower posterior corner prominent: axillary pore very small. Gill membranes forming a broad fold across isthmus.

Dorsal fin short, base not including spine equal to base of adipose dorsal: dorsal spine robust, but little shorter than pectoral spine, about two in head: its anterior serræ small and tubercle-like: its posterior edge, as well as that of pectoral, retrosely serrate: soft rays of dorsal extending but little beyond spine, the longest about three-fifths length of head. Adipose dorsal about one-half as high as long. Caudal lobes unequal, the upper lobe about one-third longer than lower lobe. Anal short, of medium height. Distance from vent to base of ventrals one-half distance from origin of anal. Pectoral spine very strong, its anterior margin with serræ towards the tip, which become small tubercles towards base: soft rays but little longer than spine, which reaches slightly beyond one-half distance from its origin to base of ventrals.

Color dark blue with silvery reflections on sides: belly pale, mental barbels dusky: maxillary barbels light below and black above: paired fins darkest on inner side: other fins almost uniformly dusky.

One specimen, 19¼ inches long, was taken by the Hopkins expedition in the estuary at Mazatlan. It is numbered 1575 in the collection of the Leland Stanford Jr. University.

27. **Galeichthys guatemalensis** (Günther).

Taken by Dr. Gilbert at Mazatlan: not seen by us. Also recorded from Chiapam (Günther), and the coast of Colima (Xantus).

28. **Netuma platypogon** (Günther).

Very common at Mazatlan: several specimens taken in Astillero, where it is scarcely less abundant than *Galeichthys gilberti*. Also recorded by Dr. Gilbert from Mazatlan, Libertad and Punta Arenas: by Günther from San José: and by Steindachner from Magdalena Bay and Callao. To the southward it is very abundant.

In some specimens, perhaps females, granulations are visible on the occipital process only, the other bones being covered by smooth skin, as in the subgenus called *Galeichthys*. This species much resembles *Galeichthys gilberti*. It is, however, readily known by the short, pale ventrals, as well as by the generic character of the backward extension of the palatine bands of teeth.

29. **Netuma kessleri** (Steindachner).

Recorded by Steindachner from Altata; recorded from Panama both by Gilbert and Steindachner. Not taken by us.

30. **Sciadeichthys troscheli** (Gill). BAGRE COLORADO.

Rather common in the Astillero at Mazatlan, reaching a considerable size. Also taken at Mazatlan by Gilbert, at Altata by Steindachner: found by Gilbert and Steindachner at Panama, and by Gilbert at Punta Arenas. Its general coloration is decidedly reddish or coppery. The sculpture of the large dorsal shield and of the occipital process is subject to considerable variation, and possibly more than one species of this type exists.

We follow Dr. Eigenmann in referring the short description of *Sciades troscheli* Gill to the species called *Arius brandtii* by Steindachner. Dr. Gill does not fully describe the dorsal shield and the type of his description is lost. In recalling the matter to his memory, he is, however, positive that the type of *troscheli* had the large dorsal buckler shown in Steindachner's figure of *brandtii*. In that case *troscheli* and *brandtii* must be the same.

Family MURÆNIDÆ.

31. **Muræna lentiginosa** Jenyns. Anguila Pinta.

Not rare in the rocky places about the islands at Mazatlan, where a few specimens were taken by us. Numerous others, the types of *Muræna pinta*, were found by Dr. Gilbert. The species is widely distributed, having been recorded from Cape San Lucas (Xantus), Colima (Xantus), Panama (Rowell) and San Josef Island (Nichols).

32. **Lycodontis dovii** (Günther). Anguila Pintita.

Not seen by us at Mazatlan. The original types of *Muræna pintita* (which we now identify with *dovii*) were taken at Mazatlan by Dr. Gilbert. Specimens which we have elsewhere referred to this species have been recorded from Espiritu Santo (Belding), Galapagos Islands (Herendeen) and from Panama (Günther).

The name *Gymnothorax* as originally proposed by Bloch, is an exact synonym of *Muræna* as understood by us. Of the many later names applied to this type, *Lycodontis* of McClelland seems to claim priority.

33. **Lycodontis castaneus** (Jordan & Gilbert).

This enormous eel is very common about the islands near Mazatlan, where numerous specimens were obtained both by Dr. Gilbert and by us. Our largest specimen is 5½ feet in length. The species is very close to the West Indian *Lycodontis funebris* (Ranzani), but is apparently distinct from the latter. The colors are not the same, *funebris* being of a greenish black and *casteneus* bordering upon purplish chestnut. This species and its congener *(funebris)* reach a larger size than any other American morays.

Family OPHICHTHYIDÆ.

34. **Myrichthys tigrinus** Girard. CULEVRA.

Not uncommon in the harbor of Mazatlan, where several specimens (types of *Ophichthys xysturus* Jordan & Gilbert) were taken by Dr. Gilbert. Several specimens were also obtained by us. It has been recorded also from Acapulco and Panama. The original types of *Myrichthys tyrinus* were said to come from Adair Bay in Oregon. It has, however, not yet been taken north of the Gulf of California, and the locality assigned to the type is very doubtful. We have not been able to find a bay of this name on any map of Oregon.

35. **Ophichthus triserialis** (Kaup.) (*Ophisurus californiensis* Garrett; *Herpetoichthys callisoma* Abbott.)

Recorded by Gilbert from Mazatlan; not seen by us. A specimen certainly belonging to this species has been lately obtained by Dr. Gilbert in the Bay of Monterey. The only other definitely known localities are Cape San Lucas and the Galapagos Islands, whence it was described as *Ophichthus rugifer* Jordan & Bollman.

36. **Ophichthus zophochir** Jordan & Gilbert.

Rather common in the Bay of Mazatlan, where it was also taken by Dr. Gilbert. We have examined specimens from Acapulco.

Olive brown, abruptly paler olive below middle of side. Dorsal with a black edge, which shades toward olive at base of fin: anal similar, paler. Pectoral uniformly dusky, the base paler. Teeth 2-rowed above and below, canines small. Pectoral 2⅖ in head: snout 5½: eye 1⅔ in snout: gape 2⅗ in head: head and body 1⅔ in the long tail.

Family MURÆNESOCIDÆ.

37. Muræenesox coniceps Jordan & Gilbert. Culevra Blanca, Anguila Blanca.

Very common about the islands in the neighborhood of Mazatlan. It reaches an enormous size, a specimen obtained by us being 6 feet and 10 inches long and having a girth of 22 inches.

Family CHANIDÆ.

38. Chanos chanos (Forskål). Sábalo.

Very common on the sandy shores of the bay, reaching length of about 5 feet. The flesh is poor, and the fish is seldom brought into the market, but is frequently used as bait. The hard enamelled scales are used for ornamental work by the Indians. We are unable to see any difference between our specimens and others brought by Dr. Jenkins from the Hawaiian Islands. We have no doubt that our species is identical with the common East Indian form.

Head $4\frac{2}{5}$; depth 4; D. 2, 12; A. 2, 9; V. 12; scales 12–70–14; snout $3\frac{1}{2}$ in head: eye $3\frac{1}{2}$: maxillary $4\frac{1}{3}$; pectoral $1\frac{3}{5}$: ventral $1\frac{4}{5}$: caudal $\frac{1}{3}$ longer than head; dorsal $1\frac{1}{4}$ in head.

Body elliptical, moderately compressed, the caudal peduncle slender. Head pointed, rounded above. Eye and side of head covered by a large transparent, imperforate adipose eyelid. Mouth small, terminal, toothless, transverse, the lower jaw included; maxillary broad, slipping under the adipose preorbital, without supplemental bone. Branchiostegals 4. Opercle truncate behind. Pseudbranchiæ very large. Gill-rakers fine and flexible, very close set, rather long, the gill-rakers of all the arches bound together so as to form a perfect strainer. Bones of gill-rakers flexible. Scales firm, enamelled at base, with strongly marked longitudinal striæ, becoming bony when dry; used by the Indians for ornamental work. Lateral line well developed. Dorsal somewhat nearer snout than base of caudal, before ventrals, its first ray falcate, its last produced in a short filament, longer than pupil. Base of fin with a large scaly sheath; pectoral and ventral with scaly axillary appendage. Anal similar to dorsal, but much smaller. Pectorals and ventrals rather small; caudal very long, forked to the base, its lobes subequal, straight; base of fin with small scales. Ventrals somewhat falcate.

Brilliant silvery in color, greenish above; fins more or less darker; inside of pectoral and ventral blackish.

Stomach forming a muscular crop. Pyloric cæca many. Intestinal canal long, filled only with remains of plants.

The skeletal peculiarities of *Chanos* are numerous and remarkable, many archaic characters persisting. The following account of the skeleton has been prepared by Mr. Starks:

SKELETON OF CHANOS CHANOS.

a. Cranium.

The frontals are very large, covering nearly the whole top of the head, and extending over the dorso-anterior part of the parietals, supra-occipital and the parotic process.

On the side of the skull there is an area bounded by the supra-occipital, the opisthotic and the sphenotic, which is not ossified but is composed of cartilage.

Between the frontals, at about their middle, there is a place in which the bone is fibrous and largely cartilaginous; it is easily broken through.

The basal cavity under the brain cavity is large.

On the upper part of the operculum is a large scale-like bone.

The suborbitals are well developed and plate-like, extending back nearly to the posterior edge of the preopercle.

b. Vertebral Column.

There are forty-two vertebræ in the spinal column.

The first vertebra is co-ossified to the skull, and apparently bears no ribs; the second vertebra supports a pair of very small, slender ribs, which articulate directly with the sides of the vertebra; the third vertebra supports the first pair of large ribs; they are articulated with the transverse processes.

The first fourteen or fifteen neural spines and pairs of transverse processes are articulated with the vertebræ by sutures, they are easily separated from the vertebræ by boiling or maceration.

The vertebræ gradually increase in size and reach their largest size about two-thirds of the distance from the anterior to the posterior end of the spinal column, where they are three or four times the size of the anterior ones. This character is more marked in the adult than in the young.

c. Shoulder Girdle.

The shoulder girdle is exceedingly well braced, the post-temporal is widely forked, and strongly articulated to the epiotic processes of the skull.

The supra-clavicle is long and slender, its posterior face is hollowed out and attached some distance from the upper end of the clavicle, which projects upward.

This projecting upper end of the clavicle is braced to the skull by two long bones.* The first bone is very slender, at its anterior end it is connected to the exoccipital: near its middle it is connected with the posterior end of the post-temporal, at which point it turns at a sharp angle and runs to the clavicle. The second bone is much larger, it is articulated to the basioccipital. Its posterior edge is nearly straight for its whole length, but its anterior edge is produced and much swollen near its middle, and joins the post-temporal over the first bone, then runs to the upper end of the clavicle.

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* See Dr. R. W. Shufeldt's report on the osteology of *Amia calva;* Bull. U. S. F. C., 1883, page 59.

The inner part of the clavicle and the coracoid are thin and pierced by many holes, so that the bone in places is little more than network.

The hypercoracoid has a very large foramen; at its posterior edge is a projection which supports a thin bone, probably a dermal bone.

The mesocoracoid is well developed.

There are four actinosts; the first is long, but they rapidly decrease in size to the fourth, which is short and triangular.

The first ray of the pectoral is large at the basal end, and hollowed out; it works directly on the hypercoracoid.

d. Branchial Apparatus.

The branchial apparatus is peculiar in the adult, in having gill-rakers somewhat resembling the filaments of a feather, on both sides of each arch and on the basibranchial. They meet in a middle line between the arches and unite forming a continuous lattice-work screen, through which nothing but the very smallest bodies can pass. The pharyngeals have no teeth, but have gill-rakers similar to those on the arches: they are enclosed in sac-like projections on each side.

This description is taken from the skeleton of a large specimen 4 feet long. The gill-rakers are not united in young specimens.

e. Other Parts.

The septæ between the myotomes are ossified about half an inch under the skin, forming long, slender rays of bone.

There is an upper series running from the middle of the sides up on the back, and a lower series from the sides down on the belly, they form a sort of a basket around the body. Those below have a single branch near the middle of each, the ones above have two branches each, these branches are lost towards the posterior end.

These bones are not present in the young.

The large caudal fin is attached very firmly to the hypural, the long rays of each lobe join the hypural at about the same oblique angle, the base of each ray is deeply divided and articulated immovably with the hypural. The middle short rays are all nearly horizontal and are much less firmly fastened.

The first interspinal ray of the anal is hollow and cone-shaped, the posterior end of the air-bladder runs into it as in the genera *Eucinostomus* and *Calamus*. The scales are very thick and closely imbricated: the skin anteriorly is a quarter of an inch thick.

Family ELOPIDÆ.

39. **Elops saurus** Linnæus. CHIRO.

Very common in the estuary, ascending into brackish mud puddles at high tide; not valued as food. Also found by Gilbert at Mazatlan.

Family ALBULIDÆ.

40. **Albula vulpes** (Linnæus). SANDUCHA.

Very common in the estuary at Mazatlan; not valued as a food fish. Also found by Gilbert at Panama and Mazatlan. The band-shaped young, which Dr. Gilbert has shown to be the larvæ of this species, were obtained in abundance.

Family CLUPEIDÆ.

41. **Sardinella stolifera** (Jordan & Gilbert). SARDINA DE ACEITE. Plate xxviii.

Exceedingly abundant in the Astillero at Mazatlan, where many specimens were taken by Dr. Gilbert, as well as by the Hopkins expedition. This species is also recorded by Gilbert from Panama, and has been found in several other localities. The flesh of this sardine is very rich and delicate, quite equal to that of the European Pilchard *(Clupanodon pilchardus)*, and it is therefore a most excellent pan fish. It is, however, not eaten by the Mexicans, no fish having less than one-half pound weight being salable in the market at Mazatlan. The art of properly cooking delicate fish like this is unknown to the people of this region.

42. **Opisthonema libertate** (Günther). SARDINA MACHETE.

Common in shallow water, in the surf and in the harbor at Mazatlan, where it was also taken by Dr. Gilbert.

43. **Opisthopterus lutipinnis** (Jordan & Gilbert).

Extremely common in the surf outside the bay, where great numbers are taken with the seine; a delicate fish which, probably, is of excellent quality as food.

Our specimens are all smaller than the single one taken by Dr. Gilbert at Mazatlan, and they differ in some minor details. Doubtless all belong to the same species.

Head $4\frac{2}{5}$; depth $3\frac{5}{6}$: scales 48–13; D. 14; A. 54; snout 4 in head; eye $3\frac{1}{3}$: maxillary 2; pectoral $1\frac{1}{6}$; anal base $2\frac{1}{4}$ in body; scutes 27.

Gill-rakers moderate, slender, about x+15.

Body strongly compressed, translucent, the belly much compressed, with sharp scutes; vent midway between tip of snout and base of caudal. Front of dorsal midway between preopercle and base of caudal. Teeth strong, sharp, unequal in both jaws; small teeth in patches on palate and tongue. Maxillary pointed behind, reaching middle of eye.

Color bright silvery, bluish above: a very distinct black spot at shoulder on level of eye, two-thirds diameter of eye; chin and nose black. Fins all pale, with no yellow; a trace of a broad diffuse, lateral streak of silvery, most distinct in young. Upper ray of pectoral dusky, some pale olive spots on back, very faint.

Very many specimens taken, the longest 5½ inches in length.

Family ENGRAULIDIDÆ.

44. **Stolephorus miarchus** Jordan & Gilbert.

Obtained by Dr. Gilbert in the open water about Mazatlan; not found by us. These translucent type specimens are apparently immature, but the small number of anal rays would indicate that it is a species distinct from any other now known.

The immature or larval specimens obtained by us in the open sea have the fin-rays of *Stolephorus ischanus* and must belong to that species.

45. **Stolephorus exiguus** Jordan & Gilbert.

Originally found by Dr. Gilbert in the Astillero at Mazatlan; not seen by us.

46. **Stolephorus curtus** Jordan & Gilbert.

Rather common in the Astillero at Mazatlan, where it was originally found by Dr. Gilbert. Numerous specimens taken by us.

47. **Stolephorus ischanus** Jordan & Gilbert.

Very common in the Astillero at Mazatlan, where it was originally found by Dr. Gilbert. Many specimens obtained.

In the open sea many slender larvæ, similar in form to *Stolephorus miarchus* were obtained by the use of dynamite. The number of anal rays shows that these larvæ belong to the present species.

48. **Stolephorus lucidus** Jordan & Gilbert.

Originally found by Dr. Gilbert in the Astillero at Mazatlan; not obtained by us.

49. **Stolephorus scofieldi** Jordan & Culver, n. sp.

[*] Head 3¾ to 3$\frac{9}{10}$ in length to base of caudal; depth 4½ to 5; eye 3¾ to 4 in head; dorsal 12; anal 25 or 26; scales 41 or 42.

Close to *Stolephorus delicatissimus*, but with larger head, wider lateral band, and greater number of dorsal and anal rays.

Body somewhat compressed and elevated, the belly not carinated or serrated. Teeth in both jaws, and on palatines; a few on vomer. Maxillary covered with teeth its entire length and reaching beyond base of mandible, but not to opercular margin.

Gill-rakers 10+12, the longest a little more than half the eye.

Origin of dorsal midway between base of median caudal rays and center of eye; anal not quite as long as head, its origin below the middle of dorsal. Lower caudal lobe longer than upper; longest ray equaling length of

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[*] The following are the measurements, etc., of seven specimens:

Anal rays.	Dorsal rays.	Head in length.	Depth in length.	Eye in head.	Scales.
26	12	3 9/10	4¾	4	42
26	12	3 9/10	4½	4	41
26	12	3 9/10	4¾	3¾	42
25	12	3 4/5	4¾	3¾	41
26	12	3¾	4¾	3¾	42
26	12	3¾	4¾	3¾	42
25	12	3¾	5	3¾	41

the head: shortest caudal ray $2\frac{1}{2}$ in longest. Pectorals not reaching ventrals, $1\frac{3}{4}$ in head. Both anal and dorsal fins preceded by a rudimentary spine, not half length of first true ray.

Color translucent, with a distinct broad silvery stripe as wide as the eye, growing more diffuse at lower anterior edge, narrowing on caudal peduncle, and becoming fan-shaped on the base of caudal. Tip of snout black; a distinct median band of black specks extending from tip of snout to base of caudal. No distinct black markings on fins.

Length, 3 inches. Type, No. 2941, L. S. Jr. Univ. Mus.

Found in the Astillero at Mazatlan, not very abundant.

Named for Mr. Norman Bishop Scofield, a member of the Hopkins expedition to Sinaloa.

50. **Anchovia*** **macrolepidota** (Kner & Steindachner).

Originally described from the neighborhood of Panama; recorded by Dr. Gilbert from the Bay of Mazatlan, but not seen by us there; apparently rare.

Family SYNODONTIDÆ.

51. **Synodus scituliceps** Jordan & Gilbert. CAIMAN.

Not very common, on sandy bottoms in the Bay, where the species was originally found by Dr. Gilbert; also recorded from Panama.

Color brown, with markings of pale bluish green. No yellow anywhere.

52. **Synodus jenkinsi** Jordan & Bollman.

Not rare, occurring in deeper water than the preceding and reaching a much larger size. The two species are very closely related, but seem to be distinct. In *Synodus*

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* *Anchovia* (Jordan & Evermann, Fishes of North America), is a new generic name applied to this species, distinguished from *Stolephorus* by its robust form and the absence of teeth in the adult.

jenkinsi, the head is much larger and the form more robust, besides slight differences in the scales. The specimens obtained were sent to us by Señor Ygnacio Moreno after our departure from Mazatlan.

Family PŒCILIIDÆ.

53. **Pœcilia butleri** Jordan.

Common in the fresh waters of the Rio Presidio below the village of Presidio, where the species was originally taken by Mr. Alphonse Forrer.

Head 3½; depth 2¾ to 3⅓; dorsal 9; anal 6; scales 26–9; eye 3 in head, equal to snout; interorbital 2; pectoral 1¼ in head; caudal equal to head. Longest dorsal ray 1¼ in head in male; 1⅔ in female.

Body much deeper and more compressed than in *Pœcilia presidionis*, the profile rather steeply rising to front of dorsal. Dorsal and ventral outlines of head meeting at mouth and forming a somewhat sharp point; snout as viewed from above, truncate. Teeth in two series, the inner smaller, more close set, not trifid, the two series well separated. Interorbital space wide and flat, about twice as wide as eye.

The sexes differ greatly in the position of the anal fin, it is under or rather behind dorsal in females, much in front in males, the tips of ventrals reaching much past the base of fin. The sexes similar in size, not very unlike in coloration; both with traces of faint olive cross-bands, especially on caudal peduncle; a dark curved streak behind eye on opercle bounding a roundish silvery area on opercle and breast.

Male green with pale blue spots on each scale surrounded by pale bronze shades; no bars. Dorsal and caudal pale orange, with many small black spots. Lower fins pale. Female similar, paler, without cross-bands, with a dark spot behind pectoral; lower fins bright orange, caudal nearly plain; dorsal speckled as in male. Form similar to that of male, deeper than in *Pœcilia presidionis*.

Alcoholic specimens show no dark spot behind pectoral and only a few specimens show traces of orange coloration on fins.

The following is a list of the species of fishes found in the fresh waters of Rio Presidio about Presidio and Villa Union:

Sardinella stolifera. Scarce.
Pœcilia butleri. Rather common.
Pœcilia presidionis. Very common.
Thyrina crystallina. Rather common.
Agonostomus nasutus. Very common in ripples.
Siphostoma starksii. Common in algæ in sluggish water.
Centropomus ensiferus. Common in cut-offs of rivers.
Centropomus pedimacula. Scarce.
Eucinostomus gracilis. Common.
Xystæma cinereum. Not rare.
Heros beani. Common in deep places.
Philypnus lateralis. Common (young very common).
Eleotris æquidens. Scarce.
Dormitator latifrons. Common.
Awaous taiasica. Common.
Citharichthys gilberti. Not rare in river; colors very bright.
Achirus mazatlanus. Very common.
Achirus fonsecensis. Scarce.

54. Pœcilia presidionis Jordan & Culver, n. sp. Plate xxix.

In the clear waters of the Rio Presidio, about Presidio; with the preceding, and still more abundant.

Head $4\frac{1}{5}$; depth $3\frac{1}{5}$ to $4\frac{1}{5}$; D. 7 or 8; anal 7; scales 28–9; eye equal to snout, $3\frac{1}{2}$ in head; interorbital 2; caudal 1 to $1\frac{1}{5}$; pectoral $1\frac{1}{4}$. Body rather elongate, shaped as in a *Fundulus*, the profile scarcely rising to dorsal.

Teeth much as in *Pœcilia butleri*, the outer smaller than in *butleri;* broad and movable, apparently in two well separated series, the inner row similar to the outer, but smaller.

Fins all low and short, except anal in male, in which the first one or two rays are produced and extend back nearly to the caudal fin.

Dorsal in female inserted over middle of anal, behind anal in male; caudal truncate.

Female greenish above, sides with violet sheen; three or four black cross bars, sometimes obsolete in adult, but very distinct in young: one or two blackish oblong spots before the anterior bar, representing other bars; a dark pencil-like streak on sides of body below the scales: a dark blotch on opercle: a trace of a dark ocellus on last ray of dorsal at base. Fins without spots: lower fins plain; a dark streak along edge of caudal peduncle: faint traces of black markings on edge of dorsal and caudal.

Male much smaller, reddish, with the lower fins yellowish; the coloration generally similar; both sexes rather dull.

Type, No. 2687, L. S. Jr. Univ. Mus.

Family ESOCIDÆ.

55. **Tylosurus fodiator** Jordan & Gilbert. AGUJON.

Common in the harbor at Mazatlan, where numerous specimens, large and small, were taken; the largest of these is about four feet long.

It reaches a length of five feet. Greatly valued as food in Acapulco: but not at Mazatlan, the people disliking it on account of the green bones. It often leaps at lights in boats, and is regarded as a species dangerous to fishermen, as its sharp beak readily pierces their scanty clothing.

56. **Tylosurus stolzmanni** (Steindachner). SIERRITA.

Occasionally taken in the harbor of Mazatlan, where specimens, the types of *Tylosurus sierrita*, were taken by Dr. Gilbert. One large specimen obtained by us. Its measurements differ somewhat from those given in the type of *Tylosurus sierrita*. The distance between the eyes is 8¾ in head. The maxillary reaches beyond the vertical from front of pupil. The eye is 3 in postorbital part of head. Head not quite 2 in length. D. 1.15; A. 1.17. Pectorals with dusky specks, but not notably black at tip.

This fish is probably identical with *Tylosurus stolzmanni*, described by Steindachner from Tumbez, Peru. The snout in our specimen, as in the type of *sierrita*, is shorter than in *Tylosurus stolzmanni*.

Family HEMIRAMPHIDÆ.

57. **Hyporhamphus roberti** (Cuvier & Valenciennes). PAJARITO.

Exceedingly common about Mazatlan, swimming in schools in open water, especially numerous in the bay; those of the same age and size go together. Schools of adults and schools of half grown specimens will be found, each moving about independently of the other. It is highly valued as a food fish, although distinctly inferior to *Sardinella stolifera*.

Lower jaw, measured from tip of upper, two times length of rest of head. Snout, 2½ in head.

This species is found along the whole Pacific Coast of tropical America, and from Cape Cod to the mouth of the Rio Grande, being everywhere common southward. We have seen no specimens from the West Indies.

The type of *Hemirhamphus roberti* Cuvier & Valenciennes, came from Cayenne, coll. Poiteau. Through the kindness of our friend, Dr. F. Bocourt, of the Museum at Paris, we have received a drawing of this specimen. In the drawing the lower jaw, from tip of upper, is 1¾ times length of head. The head, with lower jaw, is $1\frac{5}{6}$ times in length from tip of upper jaw to base of caudal. The ventral is midway between front of eye and base of caudal. The name *roberti* belongs, therefore, to the common long-jawed form; the short-jawed West Indian form being *Hyporhamphus unifasciatus.*

Family SYNGNATHIDÆ.

58. **Siphostoma starksii** Jordan & Culver, n. sp. CULEVRA DE RIO. Plate XXX.

Common in the Rio Presidio in sluggish water, on the bottom, about a mile below the village of Presidio. The species is probably found in brackish and fresh waters rather than in the sea.

Head 10½; depth 21; dorsal 38, on 0+10 or 11 rings. Rings 13 or 14+37 or 38. Head and body in tail 2. Snout $2\frac{3}{5}$ in head. Dorsal half longer than head.

Body rather stout. Head scarcely carinate above. Snout with a slight smooth carina. Two lateral keels, confluent into one behind.

Belly slightly keeled; no keel on opercle.

Color, dark olive, much mottled with darker but without distinct markings; yellow below.

Male and female common in the fresh waters of Rio Presidio among algæ; not seen in salt or brackish water. The pouch of the male teeming with eggs in January.

Length 4 to 6 inches.

Type, No. 2686, L. S. Jr. Univ. Mus.

59. **Siphostoma arctum** Jenkins & Evermann.

Two specimens taken in the Astillero at Mazatlan, both males, the egg-pouch filled with eggs. Length 4 inches. Previously known only from Guaymas. This species resembles the preceding, but its dorsal fin has but 20 rays, being placed on $0+5$ rings.

60. Hippocampus ingens Girard. CABALLITO DE MAR.

Rare in the harbor at Mazatlan. Three male specimens and one female, each about six inches long, obtained. Also recorded by Dr. Gilbert.

D. 19. Rings about $11+36$; dorsal on $3+2$ plates.

Spines on head and body high, with large fringed flaps and with many small papillæ. Every 3d to 5th tubercle of dorsal series enlarged.

Greatest depth $1\frac{1}{10}$ to $1\frac{1}{3}$ in head. Tail longer than rest of body. Snout moderate, $2\frac{1}{5}$ to $2\frac{1}{4}$ in head, rather longer than opercle, $2\frac{1}{3}$ times eye. Shoulder girdle with three tubercles; anterior spine on frontal triangle much smaller than the others.

Color blackish, unspotted, faintly barred with darker; dorsal speckled with black and edged with white; papillæ on body pale, giving an appearance of scattered whitish dots everywhere; a white speck before eye; a faint trace of radiating streaks behind it; one specimen further dotted with black on body, the radiating streaks behind eye distinct.

Here described from an adult male, 6 inches long. The female is entirely similar except that the body is much more slender, the depth $1\frac{3}{5}$ in head; the snout is longer, as long as rest of head.

The male specimens agree fairly with the description of *Hippocampus ingens*. The female evidently corresponds to *Hippocampus gracilis* Gill.

Family FISTULARIIDÆ.

61. Fistularia depressa Günther. CORNETA.

Common in the Bay at Mazatlan; many specimens taken with the seine in shallow water. Also, found in abundance by Dr. Gilbert; not yet recorded from localities further south.

Family ATHERINIDÆ.

62. **Eurystole eriarcha** (Jordan & Gilbert). Plate xxxii.

One specimen found in a rocky pool by Dr. Gilbert; a second one taken by us with a seine on the sandy beach just south of Mazatlan. Only these two specimens are known, and the species is probably rare. This species is allied to the genus *Menidia* rather than to *Atherina*. It differs from the species of *Menidia* chiefly in the extremely long anal fin and in the smallness of its dorsal, which is unusually far backward. These characters have been used by Jordan and Evermann to define the genus *Eurystole*, of which this species is type. The mouth is shorter than in *Menidia*, but its structure is exactly the same.

Head 5; depth 5; dorsal III–I, 11 or 12, anal I, 27; scales about 48.*

Body short, deep, much compressed; head short, deep, about ¼ longer than deep, rather broad above; opercles, truncate behind, the interorbital space about equal to eye. Mouth very small, terminal, very oblique, with curved cleft as in *Menidia;* the premaxillary very short, wide behind, with curved edge, slipping under the narrower maxillary; the premaxillary protractile, but not much movable; jaws subequal, the lower slightly included. Maxillary scarcely as long as eye, not quite reaching front of eye. Teeth rather large, hooked backward. Snout short, 3½ in head. Eye large, 2¾ in head. Gill-rakers numerous, long and slender. Scales smooth, caducous, not easily counted, 21 before dorsal. Pectoral moderate, not falcate, inserted high, 1⅓ in head, 6 in body, reaching to the middle of the small ventral. Belly not especially compressed, not cultrate. First dorsal very small, slightly nearer snout than base of caudal, over first ray of anal; last ray of dorsal much before last of anal. Anal very long, somewhat elevated in front, its base 3 times in length of body. Soft dorsal and anal scaleless.

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* Not to be exactly counted; the number (36–7) stated in our original description is an error.

Color translucent green, very pale; back, lips and bases of vertical fins faintly dotted; lateral band very broad and highly silvery, about two-thirds as broad as eye; lower fins pale; air-bladder not visible through the flesh.

One specimen, 2¾ inches long.

63. **Thyrina evermanni** Jordan & Culver, n. g. and n. sp. Plate xxxiii.

Common in the estuary. In this species the structure of the mouth is exactly as in *Thyrina crystallina*. It differs from that seen in *Menidia* only in having the upper jaw shorter. It is apparently closely related to the genus *Atherinella* of Steindachner, but it has not the toothed scales of the type of that genus, *Atherinella panamensis*. The other characters of *Atherinella*—the great length of the pectoral fin, the great compression of the breast and the long anal fin—are shared by this species which we have made the type of a new genus, *Thyrina*. The name (*θύρις*, window) refers to the translucent sides. Both *Eurystole* and *Thyrina* are intermediate between *Menidia* and *Atherinella*.

Thyrina evermanni differs from *Thyrina crystallina* in the longer anal, the more falcate pectoral, the smaller scales, more compressed breast and the absence of black on the fins.

Head 4¾; depth 4⅔ to 5; dorsal IV, I, 7; anal I, 23 to I, 25; scales 36–9; eye 2⅔ in head; snout $3\frac{2}{5}$ in head; maxillary $3\frac{2}{5}$ in head; lower jaw 2⅔ in head;

pectoral 1¼ longer than head, 3½ in body; caudal slightly longer than head: interorbital space broad, nearly equal to eye.

Body much compressed, the belly sharp edged, concave on each side below pectorals, as if pinched together between the fingers, the ribs reaching the edge, the scales passing around it; the edge almost carinate. Back narrow. Scales smooth, none on dorsal or anal. Mouth small, terminal, the short jaws curved, the structure precisely as in *Menidia*, the teeth moderate, curved, those in the upper jaw longer; opercles oblique behind, not vertically truncate. Gill-rakers numerous, long and slender. Pectorals very long and falcate, reaching to front of anal and beyond tips of the short ventrals, their posterior margin concave; spinous dorsal small, inserted midway between edge of preopercle and base of caudal, about over sixth ray of anal; last ray of dorsal considerably before last of anal; base of anal 1⅔ times length of head, 2¾ in body.

Color, light green, much dotted above, translucent below; a black streak of dots along base of anal; some on sides of head; median line of back dusky; fins all pale; no black on spinous dorsal, ventral or pectoral; lateral stripe ⅔ width of eye, underlaid by black; a large, perfectly transparent, space above front of anal, marking the posterior portion of the air-bladder.

Length, 2½ to 3 inches. Rather common in the estuary at Mazatlan.

About twelve specimens obtained, numbered 2688 in the L. S. Jr. Univ. Mus.

64. **Thyrina crystallina** Jordan & Culver, n. sp.

Rather common in the Rio Presidio in fresh water; not seen elsewhere. It is apparently not found in the sea, but confined to fresh or brackish waters.

Head $4\frac{3}{4}$: depth $4\frac{1}{2}$ to 5; dorsal IV–I, 8; anal I, 21; scales 40–11; pectoral $\frac{1}{5}$ longer than head, $4\frac{1}{4}$ in body; anal base more than half longer than head, 3 in body; eye $2\frac{3}{4}$ in head; snout $3\frac{1}{4}$; maxillary $2\frac{2}{3}$; lower jaw $2\frac{1}{2}$.

Body rather deep and compressed; snout shortish; opercle shortish, rounded behind; mouth small, the upper jaw very protractile, the premaxillary strongly curved; jaws equal; teeth rather strong, the outer curved, those in upper jaw largest; eyes very large, silvery; breast compressed, as in *Thyrina evermanni*, but less sharp at edge, appearing as if pinched between thumb and finger; pectoral long, pointed, not truly falcate, reaching more or less past the middle of the short ventrals, its posterior margin not concave, the middle rays considerably more than half length of upper rays; dorsal and anal naked; gill-rakers numerous, long and slender; first dorsal small, behind front of the long anal, midway between gill opening and base of caudal; first ray of soft dorsal over about fourth of anal; last rays of soft dorsal considerably before last of anal. Caudal lunate, the lower lobe the longer and broader, as long as head. Color, translucent green, with considerable dusky dottings, no yellow; fins dotted; ventrals black, as are lobes of second dorsal and anal; silvery stripe narrow, little more than half diameter of the eye; first dorsal and base of anal dusky; air-bladder evident through the translucent sides of body, but less clearly so than in *Thyrina evermanni*.

In fresh water, very common in the lower Presidio; many specimens taken; the longest $3\frac{1}{4}$ inches long. Type, No. 2685, L. S. Jr. Univ. Mus.

Family MUGILIDÆ.

65. **Mugil cephalus** Linnæus. Lisa Macho. Lisa Cabezuda.

Very common in the bay of Mazatlan; a fish of almost universal distribution on both coasts of tropical America, and extending to Europe. We are unable to distinguish the specimens from the two coasts one from another, and find no permanent difference between these and specimens from the Mediterranean. This species is largely used as food, and often enters lagoons and sheltered places.

66. **Mugil curema** Cuvier & Valenciennes. Lisa Blanca.

Excessively common everywhere, especially in the harbor and estuary. This species is also valued as a food, but reaches a considerably smaller size than the other. In life the iris is tinged with orange, and there is an orange spot on the side of the head behind the eye. This species, like the preceding, is very widely distributed, being found on both coasts of tropical America.

67. **Mugil hospes** Jordan & Culver, n. sp. Lisita. Plate xxxi.

Rather scarce in the harbor at Mazatlan, where it occurs in company with schools of the preceding species; some eight specimens obtained by us. According to Dr. Gilbert, it is quite common at Panama, but the specimens obtained there by him in 1883 were destroyed by fire, so that the species has not thus far received a name. Most specimens of this species have in the mouth or about the branchial cavity a small Crustacean allied to *Oniscus* or *Cymothoa*, the condition being similar to that seen in the eastern Menhaden *(Brevoortia tyrannus)*. This Crustacean is found in none of the other species of mullet and its presence is a distinctive character of the present one, which is also readily known at sight by the much greater length of its pectoral fins as compared with *Mugil curema*. The Crustacean is also common and characteristic of the same species at Panama.

Head 3⅔ to 4; depth 4 to 4⅓; D. IV–8; A. III, 9; scales 38–13; eye 4½ in head; snout 4; maxillary 4.

Body a little slenderer and more compressed than in *Mugil curema*, the back considerably more arched, the profile evenly curved from tip of snout to soft dorsal. Eye moderate, with a large adipose eyelid. Head broad and round above; interorbital width 2⅗ in head. Teeth very small, perceptible with a lens. Tip of lower jaw forming about a right angle. Space between dentaries club-shaped, very much larger than in *Mugil curema*, the subopercles barely touching below. First dorsal inserted above middle of body nearly over tip of ventral spine. Second dorsal moderate; its edge incised. Upper lobe of caudal a little longer than lower, as long as head. Anal rather high. Ventral inserted before middle of pectorals. Pectoral very much longer and more pointed than in *curema*, 1¼ in head.

Soft dorsal and anal covered with small scales.

Color much as in *curema*, rather greener above, sides silvery, with less trace of longitudinal streaks. Fins pale; base of pectoral with a round black spot. Upper edge of pectoral and end of caudal dusky. No golden on head. Iris with a little brown, green above eye.

Types, Nos. 1695, 2890, 2954, L. S. Jr. Univ. Mus.

68. **Mugil setosus** Gilbert.

Four young specimens taken in a rock pool. The pectoral is as long as in *Mugil hospes*, reaching the first dorsal, and there is a distinct dark blue spot at its base. Color bluish above, much as in *Mugil curema*; much darker than in the original types of the species, with which our specimens have been compared. The original specimens came from a bottom of volcanic ashes.

69. **Chænomugil proboscideus** (Günther). LISITA.

Very common in rocky places, reaching a length of about 6 inches; not found by us in open water.

70. **Querimana harengus** (Günther). VERDE.

Very common in the bay and estuary; often seen swimming in schools on the surface after the fashion of whirligig beetles; occasionally taken in rock pools. Back bright green, in life with a large, shining, silvery spot on each side of the back. This spot becomes inconspicuous when the fish is taken out of the water, but is a prominent recognition mark while the fish is swimming.

71. **Agonostomus nasutus** Günther. TRUCHA.

Extremely abundant in the fresh waters of the Rio Presidio, especially in the swift places or ripples. It reaches a length of over a foot, but most of the specimens are much smaller.

Head 4 to 4¼; depth 4⅓ to 4½; dorsal IV–I, 8; anal usually II, 10, very rarely II, 9; scales 43–13; maxillary 3⅓ to 3⅒; eye 3⅔ to 4⅓; snout 3⅔ to 4; pectoral 1⅓ to 1½; caudal equal to head.

Body moderately elongate, not much compressed, nape prominent, rounded. Interorbital much rounded, 3 in head. Preorbital narrow, as wide as pupil. Mouth rather small; maxillary reaching front of pupil; lower jaw included. Eye large without adipose eyelid. Teeth small, in villiform bands. Gill-rakers slender, short, close set. Pectoral short, not reaching first dorsal. Ventrals under middle of its length, each with a small axillary scale. Anal and soft dorsal with the free edge concave; caudal well forked. First spine of anal very short, almost rudimentary; second $3\frac{1}{3}$ in longest soft ray. First soft ray slender, but articulate, half length of longest ray.*

Olivaceous, sides creamy, white. Many scales on sides punctate so that black scales seem scattered among the others. A conspicuous black bar at base of pectoral, followed by a white streak; a narrow black rim around lower half of eye. Fins all creamy yellow, the upper ones blotched and dotted with blackish. Young with a black blotch surrounded by orange on first dorsal. Spot on pectoral distinct at all ages.

Family SPHYRÆNIDÆ.

72. **Sphyræna ensis** Jordan & Gilbert. VICUDA.

Rather common in the harbor, where it was found by Dr. Gilbert; also recorded from Panama by Gilbert, and from San Bartholomé Bay and Panama by Steindachner. An excellent food fish, but reaching a smaller size than most species of the group.

Family POLYNEMIDÆ.

73. **Polydactylus approximans** (Lay & Bennett). RATON.

Very common, especially on sandy beaches; many specimens taken by us; also recorded by Gilbert from Mazatlan and from other localities. Used as food.

74. **Polydactylus opercularis** (Gill.)

Obtained by Dr. Gilbert from Mazatlan and Panama; not seen by us.

Family HOLOCENTRIDÆ.

75. **Holocentrus suborbitalis** Gill. MOJARRA CARDENAL.

Very abundant in all rocky pools about Mazatlan. It reaches only a small size, barely exceeding six inches, and its coloration is less red than that of the Atlantic species of the genus.

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* Apparently taken for a spine by Dr. Günther, who counts A, III, 9.

Head 3; depth $2\frac{2}{3}$; D. XI, 12; A. IV, 8; scales 3–36–7; longest dorsal spine $1\frac{3}{4}$ in head; longest dorsal ray $1\frac{3}{4}$; caudal lobes $1\frac{1}{3}$; third anal spine $1\frac{3}{5}$; pectoral $1\frac{2}{5}$; ventral rays I, 7. Seven scales on cheek. Maxillary slipping under preorbital. Ventral with accessory scale. Dorsal lying in a groove.

Body short and deep, compressed, with slender caudal peduncle; anterior profile rounded. Mouth small; upper jaw protractile. Teeth in villiform bands on jaws, vomer and palatines. Maxillary moderate, slipping under the very narrow preorbital, which, like rest of suborbital ring, is armed with close-set sharp teeth, turned backwards. Preopercle, opercle, subopercle, interopercle and postemporal armed with similar teeth. Preopercular spine nearly as long as pupil; nearly as long as eye on large specimens. Two spines on opercle.

Steel gray, underlaid by bright coppery red, which becomes brighter after death. Everywhere much punctate with black, the dots coarse. Sides, and especially back, with purple reflections. Top and side of head coppery; a curved bright silvery streak from tip of snout, below eye and around it, ceasing opposite middle of pupil. A vertical silver streak on edge of opercle and extending out on spine. Head yellowish, upper lip reddish; lower with throat silvery. Dorsal brown, clouded with reddish and dark; dark brown near edge, then a series of grayish clouds; roundish, irregular, whitish spots at its base. Second dorsal reddish, its rays pale, its first two black; the caudal red, base pale; the upper and lower rays dark yellowish, darkest in young, the dark extending on peduncle above and below. Anal spines whitish, the soft rays bright red, the last ones pale, the first soft rays dark. Ventral reddish, the spine and first soft ray whitish, the first ray dark red; when the fin is closed it seems reddish, edged with whitish or yellowish, and with a blackish line. The dark is fainter in larger specimens.

It is not impossible that *Rhamphoberyx pœcilopus* Gill is the very young of this species. *Rhamphoberyx leucopus* may be the young of *Myripristis occidentalis*, which has the ventrals plain.

Family MULLIDÆ.

76. **Upenus grandisquamis** Gill. Chivo. (*Upenus tetraspilus* Günther.)

This small species, rarely exceeding a foot in length, is generally common in the harbor and estuary at Mazatlan, where it was found also by Dr. Gilbert. It seems to be everywhere common on the coast.

Color evanescent, olive with two rows of light bluish green spots toward back, then a bronze band, then a blue streak on level of pupil; 2 or 3 yellowish streaks below it. Sides of head golden, with a light green streak forward from eye and some blue behind eye. A large black blotch below last dorsal spine. First dorsal reddish, clouded with dark. Second mesially black, edged with orange. Caudal and anal red. Ventral and pectoral pale.

In alcohol much red appears. In life, sides with curved light yellowish brown, cross bands most distinct on the silvery lower parts.

Family SCOMBRIDÆ.

77. **Germo alalunga** (Gmelin).

Recorded from near Mazatlan by Lay and Bennett; not seen by us, it being probably a migratory fish coming in the spring or fall.

78. **Scomberomorus sierra** Jordan & Starks, n. sp. SIERRA.

Rather common in the harbor at Mazatlan, numerous specimens being taken; also found by Dr. Gilbert at Panama. This is not valued as a food fish, little attention being paid to it by fishermen. This, however, may be due to the lack of appreciation of good fishes by the people of Mazatlan, who have not learned the art of properly cooking any fish.

This species is very closely allied to its Atlantic cognate, *Scomberomorus maculatus*. It differs in the slightly more backward insertion of its soft dorsal, in its coloration, the spots in *maculatus* being elliptical and fewer in number, and perhaps in the fewer pores in the lateral line (175 in *maculatus*). In *Scomberomorus maculatus* the soft dorsal is inserted one eye's diameter before anal.

Head 4¾; depth equal head; dorsal XVIII–15–IX; anal II–15–IX; maxillary 1¾ in head; eye 5 in head; pectoral 1¾; ventral 3½; dorsal and anal lobes equal, 1¾ in head.

Body elongate, its dorsal and ventral outlines about equal; profile straight from snout to dorsal; head small and pointed; mouth large, oblique; jaws equal; maxillary reaching to posterior edge of orbit. Teeth large, compressed and sharp, 26 to 32 in each jaw; gill-rakers 4+11. Soft dorsal inserted almost directly over front of anal; lateral line undulating, about 165 pores.

Silvery, above bluish, sides with numerous round brownish spots; three rows of spots below lateral line and one above. Spinous dorsal white at base, black above; soft dorsal tinged with yellowish; its margins black; anal white; posterior face of pectoral entirely black, anterior face yellowish with blackish borders; caudal black.

Another example supposed to be a male has five rows of spots below the lateral line, these spots decrease in size towards the belly, covering both sides nearly to level of pectoral.

Types, 1720, L. S. Jr. Univ. Mus.: the largest 24 inches long.

Family CARANGIDÆ.

79. **Oligoplites altus** (Günther). MONDA.

One large specimen taken by us. Recorded by Dr. Gilbert from Mazatlan and Panama.

80. **Oligoplites saurus** (Bloch & Schneider). MONDA.

Common in the harbor of Mazatlan, where it was also taken by Gilbert. On comparison of specimens from Mazatlan with others from Havana we are unable to find any difference whatever. The species called *inornatus* is therefore fully identical with *saurus*.

81. **Trachurops crumenophthalmus** (Bloch).

Common in the harbor at Mazatlan, where numerous specimens were taken; not recorded by Dr. Gilbert. Specimens have been compared with others from Havana and no difference of any kind is observable. *Trachurops brachychirus* must therefore be regarded as an exact synonym of *Trachurops crumenophthalmus*.

82. **Caranx vinctus** Jordan & Gilbert.

Rather common in the estuary, where numerous specimens were taken. The original types were found by Gilbert at Mazatlan, and the species has been recorded from San Blas and Punta Arenas.

83. **Caranx caballus** Günther. COJINERO.

Extremely common in the harbor; also found in abundance by Dr. Gilbert.

84. **Caranx medusicola** Jordan & Starks, n. sp. Plate xxxiv.

Rather common in the surf outside the harbor. Not found in the Astillero. The young from 1 to 2 inches long live in the body cavity of the large white jelly fish, which is very abundant about the Venados Islands in January. Sometimes two or three specimens will be found in the body cavity of one jelly fish.

Head $3\frac{2}{5}$; depth $2\frac{1}{5}$; D. VII–1, 22 or 23; A. II, 1, 19 or 18; scutes 30 to 32; pectoral $\frac{1}{6}$ longer than head; dorsal lobe 1⅔ in head; caudal lobe, as long as head; curve of lateral line 1½ in straight part; height in chord 4; eye 4 in head; snout 3; maxillary 3; ventral 2⅓.

Body unusually deep and compressed, the back elevated, the belly similarly arched; head moderate, deep, the nape arched. Mouth small, maxillary broad, with broad supplemental bone. Teeth in moderate bands, the outer enlarged but not canine-like; upper teeth rather larger and in broader bands. Villiform bands on vomer, palatines and tongue. Eye moderate; preorbital rather narrow. Gill-rakers rather long and slender, about 12 below angle of arch. Soft dorsal and anal with falcate lobes. Caudal well forked, the lobes equal. Pectoral very long and falcate; ventrals short. Lateral line rather strongly curved, with moderate armature. Breast entirely scaly.

Clear blue above, silvery below; no bands or spots anywhere, except a small black axillary spot and a blue green patch on back of caudal peduncle; pectoral bright yellow; anal yellow, the lobe blackish; caudal grayish, the lobes black with whitish posterior edge; ventrals yellow.

Length of largest specimens, 6 inches. Type, No. 2645, L. S. Jr. Univ. Mus.

Another example was, in life, blue above, silvery below; no dark spots on opercle or pectoral: pectoral bright yellow, very long. D. and A. and C. lobes, all tipped with black. Base of dorsal bright blue. Anal and dorsal largely blue. Base of caudal peduncle green above. No trace of bands: a slight dusky shade on axil.

The very young, taken from the body of a *Medusa*, may be thus described:

Head 3 in length: depth 2⅚: dorsal IX, 24: anal II, I, 18 or 19: ventral with a sheath: scales minute: caudal keel scarcely appreciable: lower jaw projecting; mouth oblique; body deep, compressed; caudal peduncle slender, the fin short, moderately forked: pectoral short, not falcate, shorter than head; maxillary broad, reaching pupil; preorbital narrow: dorsal and anal not falcate; lateral line arched before, then straight: jaws with teeth: preopercle with flexible spines.

Clear white, fins all pale, a bright violet blue area above and behind eye, fading in spirits: dark dots above: dorsals both dusky at tip.

85. **Caranx marginatus** (Gill).

Not rare in the Astillero, where several specimens were taken by us. This species is well distinguished from *Caranx latus*, with which it has hitherto been confounded, since it was originally described by Dr. Gill. The following are its characters:

Head 3⅓; depth 2⅔; dorsal VIII–I, 19; anal II–I, 15; eye 3⅔ in head; pectoral 3⅓ in length, equal to head; ventral 7¼; dorsal lobe 5¼; caudal 3⅔.

Dorsal outline of body evenly curved from snout to caudal peduncle; ventral outline straight from gill openings to anal spine, behind which it is curved like the dorsal portion.

Top of head, snout, lower jaw, orbitals, maxillary, lower two-thirds of opercle and preopercle naked; cheeks scaled; eye large, with membranous eyelid to posterior edge of pupil in specimens six or eight inches long, not conspicuous in young examples. Snout equal to eye, twice width of preorbital; lower jaw entering profile; maxillary reaching to posterior edge of orbit. Teeth strong, in a single row; lower teeth close together, with two canines in front; upper teeth larger, the distance between them irregular, not much enlarged anteriorly; vomer, palatines and tongue with exceedingly small villiform teeth. Gill-rakers hardly half eye, 4 + 13. Breast scaled; curved part of lateral line, 1½ in straight part; scutes large, about 30; scales, 80.

Color, silvery, bluish above with golden reflections below; a dark band along plates of lateral line; fins largely yellow, dorsal, anal and caudal, broadly edged with black; a distinct small black spot at upper end of gill-opening; a dark blotch on opercle, and one behind pectoral.

Body more elongate than in *Caranx latus*, the fin rays fewer, the eye larger and the coloration more yellow, with more black on the fins.

86. **Caranx latus** Agassiz.

Occasionally taken in the bay at Mazatlan, and generally distributed throughout the waters of the tropical Pacific and West Indies. We are unable to distinguish the specimens from the west coast of Mexico from the common West Indian form.

87. **Caranx hippos** (Linnæus). TORO.

Very common in the sea about Mazatlan, occasionally entering the estuary. A food fish of some importance, reaching the length of two or three feet. We are unable to see any difference between specimens from the west coast and specimens from Havana.

88. **Gnathanodon speciosus** (Forskål). MOJARRA DORADA.

Very common in the harbor and estuary, being one of the more valuable food fishes, the flesh being firm and delicate. We have compared specimens with others taken by Dr. Jenkins at Honolulu and find no difference. We have, therefore, no hesitation in continuing to identify our species (*Caranx panamensis* Gill) with this common East Indian fish, of which the oldest name is *speciosus*.

In life, everywhere deep golden yellow, with black cross bands.

89. **Citula dorsalis** (Gill). PÁMPANO.

Rather common in the estuary. Three specimens taken by us, one half-grown and the others adult, the change in form being strikingly marked, as will appear from the following descriptions:

Citula dorsalis (half grown):

Head 3⅕; depth 1¾; D. VI–I, 19; A. II, 1, 17; eye 4¾ in head, the orbit 3½; snout 2⅔; pectorals 2½ in body, ⅓ longer than head; ventrals 3; caudal lobe equal to head; dorsal with one long filament, as long as body, reaching middle of caudal; anal with one filament; caudal moderately elongate, the lobes equal; pectoral very long, falcate, reaching tenth anal ray; ventrals small, reaching just past vent.

Body deep, compressed, rather ovate than angular; profile straight from the vertical truncate snout to nape, then rounded, then straight to front of dorsal. A nearly straight line from chin to front of anal. Eye rather small, preorbital deep. Mouth large, the lower jaw included. Teeth small, in broad bands on jaws, vomer and palatines, maxillary reaching pupil. Cheek entirely scaly, some scales on opercle above. Breast naked, body well scaled. Body with small scales, the nuchal region naked, scarcely carinate. Gill-rakers rather long, 2+15.

Lateral line evenly curved, the curve high, equal to straight part. Scutes small, eighteen with keels; the total number of scales on straight part 58.

Steel blue above, silvery below, with golden reflections and shades; fins all pale, tinged with yellowish, none of them dusky; no black on pectorals. Axil jet black; opercle slightly dusky, blackish within; a dark spot on orbit above.

Specimen described, ten inches long.

Citula dorsalis (adult):

Length 24 inches; head 3¼; depth 2¼; D. 18; A. 17. About 25 scutes developed. Body moderately compressed, with angular outlines. Profile of head rounded, of belly somewhat concave, forming an angle at anal similar to one at front of dorsal. Eye 5 in head. Maxillary 2½; lower jaw included. Teeth in broad villiform bands on both jaws and on vomer and palatines. Nostrils large, equal, close together. Gill-rakers 3+14, rather stout, shorter than eye. Dorsal spines nearly obsolete, three of them present; first dorsal ray filamentous, 1¾ in body. Long anal ray 2¾ in body. Caudal keel considerably elevated, with a small keel above and below it; scutes not sharp. Caudal lobes subequal, about as long as head. Pectoral falcate, ⅕ longer than head. Ventral short, 3⅔ in head. Curve of lateral line low, 1⅛ times in straight part, its height ¼ its chord. Maxillary broad, with very broad supplemental bone, its width ⅔ eye.

Color, silvery, strongly tinged with golden, olive on upper parts, pearly reflections below. A large black spot in axil, nearly as large as eye. Fins pale.

90. Alectis ciliaris (Bloch). Pámpano.

Obtained by Dr. Gilbert; not seen by us. We have hitherto been unable to distinguish the specimens of this species from the two coasts of Mexico. We are furthermore unable to find any distinction between the American form called *crinitus*, and the East Indian species, *Alectis ciliaris*. We do not believe that any distinction exists, and therefore find ourselves compelled to believe that this species, like *Caranx hippos* and *Caranx latus*, is almost cosmopolitan in the tropical seas, ranging from the coast of Arabia to the West Indies. None of the three are found in the Mediterranean.

91. Hynnis hopkinsi Jordan & Starks, n. sp. Pámpano. Plate xxxv.

One large specimen taken with the seine in the harbor at Mazatlan.

Head 3½; depth 2⅕; D. VI-1, 18; A. II, 1, 15; snout 2¾; eye 3⅚ in head; maxillary 2¾; pectoral, 3⅕ in body; ventral, 2¼ in head; dorsal lobes 2⅓ in head; caudal lobes 1⅖ in head; anal lobe, 2¼; preorbital, 4¼ in head.

Body oblong, compressed, elevated, with angular outlines, ventrals outline sharp. Top of head sharply carinate; profile nearly straight from snout to nape, there boldly convex, then nearly straight to elevated front of soft dorsal; a concavity in profile before soft dorsal and before anal. Mouth oblique, rather large, the jaws equal. Broad bands of small sharp teeth on jaws, vomer and palatines. Eye very large. Dorsal and anal lobes low. Lateral line with a long arch, as long as straight part, which has about twelve elevated scutes and thirty-seven scales in all from end of curve; curved part of lateral line undulating behind. Gill-rakers short rather few, twelve in all, those above angle obsolete. Body minutely scaly. Belly and lower parts largely naked, a large patch of scales on cheeks; head otherwise naked.

Bright blue above, with bright reflections, sides bright silvery: no golden; a narrow brownish streak not quite so wide as pupil from upper part of gill opening to middle of base of soft dorsal. Pectoral tipped with black; axil of pectoral dusky. Upper fins rather dusky, lower white. Dusky on opercle inside and out but without definite spot.

More elongate than *Citula dorsalis*, the anterior profile more convex, the base of dorsal and anal more elevated, the caudal scutes stronger and fewer, the ventrals longer though the specimen is larger. Gill-rakers fewer. Pectoral long and falcate, reaching seventh anal ray. Ventrals not short, reaching vent. Caudal moderate.

One specimen obtained, twenty-six inches long, No. 1563, L. S. Jr. Univ. Mus.

We take great pleasure in naming this interesting fish for Mr. Timothy Hopkins, in recognition of his great interest in scientific research.

We provisionally admit *Citula* and *Hynnis* as genera distinct from *Alectis*. No structural characters of importance distinguish this group, and all these genera are merely form variations from *Caranx*.

92. **Vomer setipinnis** (Mitchill).

Recorded by Dr. Gilbert as common at Mazatlan and Panama: no specimens, however, were seen by us. It is not unlikely that this species disappears from the coast with the end of the rainy season.

93. **Selene œrstedi** Lütken.

Recorded by Dr. Gilbert as frequently found both at Mazatlan and Panama. One specimen, sixteen inches long, taken by Ygnacio Moreno and sent to us.

Head 3; depth 2; dorsal V–I, 15; anal (II) I–14; eye 4 in head; snout 1¾; maxillary 2¾; ventral 3⅓; caudal lobes equal to head; pectoral one-eighth longer than head.

Body compressed and elevated; profile oblique, concave over snout then straight to occiput, which is well rounded; line of back straight to soft dorsal, then lightly curved to caudal peduncle; ventral outline rounded on breast to ventrals, then straight to anal, forming an angle at first ray, then straight to caudal peduncle. Mouth projecting, with minute teeth on jaws, vomer, palatines, and tongue; gill-rakers thick and blunt, many of them knobbed at tip—in old examples at least, one above angle with 3 or 4 rudimentary ones, and 13 below. A large bony knob at occiput, conspicuous in adult, the thickened supraoccipital crest.

Pectoral falcate, reaching to tenth anal ray; dorsal and anal lobes filamentous, reaching past tips of caudal lobes; lateral line strongly arched; curve equal to straight part. Color silvery, with bluish reflections above, dorsal and caudal dark, pectoral, ventral and anal white; axil dusky.

94. **Selene vomer** (Linnæus).

One large specimen obtained by us. Recorded by Dr. Gilbert as common at Mazatlan and Panama. It perhaps disappears with the end of the autumn, going farther south.

95. **Trachinotus paloma** Jordan & Starks, n. sp. PALOMA.

A few small specimens taken in the surf at Puerto Viejo, just north of Mazatlan; other specimens were taken by Mr. Xantus on Cape San Lucas, and still others were obtained by Dr. Gilbert in San Juan Lagoon. The species is apparently not common, and it is not known to the fishermen. On the Atlantic coast, the very closely related Pámpano, *Trachinotus carolinus*, is one of the most valued food fishes. We are unable to see any difference of any importance between the present species and the Pámpano of the gulf other than the fact that in the Sinaloan form the head seems to be larger and longer. On this difference we have ventured to give a new specific name to our specimens from Mazatlan. We shall not, however, be surprised if the species proves inseparable from *Trachinotus carolinus*.

Allied to *Trachinotus carolinus*, but with the head larger.

Head 3, depth 2½; D. VI–I. 24. A. II, I, 23; eye 3½ in head; snout 3⅔; maxillary 2⅓; dorsal lobe 1⅔; caudal $1\frac{1}{10}$.

Body rather elongate, the back moderately and regularly arched; snout bluntish. Mouth large, horizontal, the lower jaw included, maxillary reaching past pupil. Lateral line little arched, its curve 1⅙ in straight part. Teeth well developed. Caudal not widely forked.

Silvery without spot or band; anal creamy orange, its tip whitish. Other fins pale, except dorsal lobe which is dusky. Axil silvery.

A few specimens taken in the surf, the largest 2½ inches long. Type No. 2690 L. S. Jr. Univ. Mus. Other specimens taken by the Albatross in San Juan Lagoon examined; some of these are five inches in length.

96. **Trachinotus rhodopus** Gill. (*Trachynotus fasciatus* Gill; *Trachynotus nasutus* Gill.)

Very common on sandy shores about Mazatlan, reaching the length of about a foot; not much valued as food. Readily distinguished at all ages by the reddish color of the lobes of the dorsal, anal and caudal. These lobes become considerably elevated with age, but at all times they are marked by shades of brownish red or maroon color. There seems to be little doubt that the *Trachynotus rhodopus* Gill is the young of the species which he called at the same time *Trachynotus fasciatus*. The very young specimens to which Gill gave the name *Trachynotus nasutus* were probably also the young of the same species, but it may be that they were the young of *Trachinotus kennedyi*. Dr. Jordan's identification of the great Pámpano of the Florida Keys with Gill's *Trachynotus rhodopus* is doubtless incorrect. There is at present no evidence that any species of *Trachinotus* is common to both coasts of Mexico.

Young specimens, 2½ inches long. Blue above, white below, no bars. Dorsal and caudal lobes black, with strong orange shade. Lobes of caudal orange brown, verging on black. Pectoral and ventral white.

Specimens 6 or 7 inches long, have from 3 to 5 narrow dark cross-bars, not quite so wide as pupil, running from a point on a level with pectoral fin to within a short distance of the dorsal line of the back, but never quite to it; these bars vary in number and position; posterior face of pectoral fin dusky. Otherwise colored as the younger ones.

97. **Trachinotus culveri** Jordan & Starks n. sp. PALOMETA. Plate xxxvi.

Five specimens, each 7 inches long, obtained in the market at Mazatlan; no others seen. This species is related to *Trachinotus falcatus* of the Atlantic, but its fins are lower and different in coloration. It is also allied to *Trachinotus kennedyi*, but the body is much deeper and there is no black axillary spot. It does not seem possible that with age *culveri* should become transformed into *kennedyi*.

Head $3\frac{2}{5}$; depth 1½; D. VI–I, 17; A. II–I, 17; maxillary 3 in head; eye $3\frac{2}{3}$: snout $4\frac{1}{3}$; dorsal lobe $1\frac{1}{10}$ in head; pectoral $1\frac{1}{3}$ in head: caudal $\frac{1}{6}$ longer than head.

Body very deep, compressed, the back much elevated. Snout very blunt and convex, the rest of profile straight and steep; base of dorsal and anal very oblique. Dorsal and anal lobes rather low. Caudal long. Lateral line little elevated in front, the curve $1\frac{1}{4}$ in straight part. Gill-rakers very short, about 5 + 9. Teeth persistent, in specimens 7 inches long.

Bluish gray, silvery below, tinged with yellow, everywhere much soiled with blackish spots, no distinct markings anywhere, the axil only slightly dusky; fins all dusky except middle of caudal and lobe of anal, and the ventrals which are whitish.

Types, No. 2691, L. S. Jr. Univ. Mus.

98. **Trachinotus kennedyi** Steindachner. PALOMETA.

Two large specimens obtained in the surf. This species was originally described by Steindachner from Magdalena Bay, and has been recorded by Dr. Gilbert from Mazatlan and from Panama.

Head $3\frac{2}{3}$; depth at vent $2\frac{1}{3}$; at anal $2\frac{1}{10}$; D. VI–I, 19; A. II, I, 16. Curve of lateral line $1\frac{2}{5}$ in straight part. Eye 5 in head; maxillary $2\frac{2}{3}$; dorsal lobe $1\frac{1}{5}$: caudal $\frac{1}{4}$ longer than head; pectoral $1\frac{1}{4}$ in head; snout $3\frac{2}{5}$; least depth of caudal peduncle $3\frac{1}{2}$ in head.

Body oblong, compressed, and elevated at bases of dorsal and anal. Anterior profile of head an even curve, the snout blunt and convex; line straight from nape to dorsal. Mouth moderate, very oblique, subinferior, the lower jaw much shorter than upper, the maxillary reaching to posterior border of pupil. Teeth obsolete. Tail widely forked, the lobes equal. Lobes of dorsal and anal low, not sharp.

Gray above, with deep green reflections, lower half silvery, with strong golden tinge. Axil jet black, the color covering base of fin and extending behind for a distance nearly equal to eye, so that the fin does not cover it; upper fins dusky, the caudal edged with paler, anal dusky with golden tinge, ventrals purplish white. Pectorals dusky; maxillary with a black streak.

99. **Seriola mazatlana** Steindachner.

Originally described from Mazatlan by Steindachner, but not seen by Dr. Gilbert or by us: probably a migratory species.

Family NEMATISTIIDÆ.

100. **Nematistius pectoralis** Gill. PAPAGALLO.

Very common in all the waters about Mazatlan: specimens reaching the length of about three or four feet found about the islands of Venados, Isla Blanca and Creston.

Color silvery, iridescent bluish above, with black bands: the first across tip of snout; the second across interorbital, involving the top of membranous eyelid; the third from nape across opercle; the fourth including the first dorsal spine and running obliquely down on the belly, where it fades out at about the tip of the pectoral fin; the fifth running from middle of first dorsal obliquely to lateral line, then backwards along lateral line to upper lobe of caudal, including the whole upper half of caudal peduncle; a sixth indistinct band, following the line of the back for a short distance, under the soft dorsal; upper part of maxillary dusky; long spines of dorsal with alternate bands of yellow and black, and much slaty-bluish at base; soft dorsal and caudal uniform dusky; pectoral with a black spot on lower rays, not involving the axil; ventrals white; anal slightly dusky.

Described from a specimen sixteen inches long.

The two anal spines united with rest of the fin. No free anal spines. Ventral ray really I, 5, the inner ray very wide, made up of four branches so that the rays seem more numerous; ventral spine obscure. Anal fin short. Pectoral fin falcate. Both dorsal and ventral with sheath. Soft dorsal and anal low, the last ray slightly lengthened.

Dr. Gill is probably right in regarding *Nematistius* as type of a family distinct from the *Carangidæ*.

Family STROMATEIDÆ.

101. **Rhombus medius** (Peters).

Originally described by Dr. Peters from Mazatlan; not seen by Dr. Gilbert or by us. Only the original type in the museum at Berlin seems to be yet definitely known.

Family CHEILODIPTERIDÆ.

102. **Apogon dovii** Günther.

This species was found by Dr. Gilbert at Mazatlan, but was not seen by us.

103. **Apogon retrosella** Gill. CARDENAL. Plate xxxvii.

Two specimens of this most beautiful little fish were obtained by us with dynamite off the Isla Blanca and Creston Islands. Only the very young, found by Mr. John Xantus, at Cape San Lucas have been hitherto known.

Head $2\frac{6}{7}$; depth $2\frac{7}{8}$; scales 3–26–9; dorsal VI–I, 10; anal II, 9; eye $2\frac{7}{8}$ in head; maxillary $1\frac{3}{4}$; snout $4\frac{1}{2}$; interorbital 4; first dorsal $2\frac{1}{4}$; second dorsal $1\frac{2}{5}$; caudal $1\frac{1}{5}$; pectoral $1\frac{1}{2}$; ventral $1\frac{3}{5}$.

Body rather plump, not much compressed, the profile rising steeply from snout to first dorsal. Caudal peduncle long and strong; eye very large; mouth large, oblique, the maxillary opposite posterior margin of pupil. Teeth small, the outer scarcely enlarged. Premaxillary protractile; no supplemental maxillary.

Bright scarlet much dotted with black, cheek with many dark points, a diffuse dark blotch on opercle; a diffuse black blotch at base of caudal. First dorsal with triangular red area in front. Second dorsal red at base, the anterior half jet black above the red, the posterior half translucent. From black anterior rays, a rather faint black saddle falls to middle of side. Caudal red at base, upper and lower lobes black, the middle pale. Anal red at base, the anterior rays black, the posterior pale. Pectoral white, the base deep scarlet. Ventral white, red at base, blackish at tip. Opercle reddish within, with some dusky. Preopercle minutely serrulate on its vertical margin only, these serrulations soft and easily rubbed off.

A younger specimen was, in life, scarlet, deeper below and on tail, fading on fins; second dorsal, anal, and caudal tipped with blackish. An oblong inky spot at middle of base of caudal. An inky bar below soft dorsal extending to level of pectoral and spreading on base of soft dorsal. A black bar from snout through eye to gill opening, broader and clearer behind, overlaid by reddish, a fainter dusky band below parallel with it.

Family SERRANIDÆ.

104. **Alphestes multiguttatus** (Günther).

This species is found in rocky places along the coast, having been taken by Gilbert at Mazatlan and Panama. But one small specimen was obtained by us.

105. **Epinephelus labriformis** (Jenyns). CABRILLA PINTA.

This species is generally common about the islands on the coast of Mexico all the way from Cape San Lucas to the Galapagos Islands. Only young specimens were seen by us.

Inside of mouth salmon yellow; pectoral with salmon color, its edge pale; caudal with a maroon band above and below; dorsal edged with blackish red, spots on belly nearly white; dorsal with white on membranes.

106. **Epinephelus analogus** Gill.

This species is also common in rocky places along the coast from Mazatlan to Panama. Several specimens were obtained by us.

107. **Promicrops guttatus** (Linnæus). MERO.

Rather common about the islands and in deep water, reaching an enormous size, greater than that of any other bony fish found in the region. The largest seen by us weighed some seventy pounds, but it is said to attain the weight at times of 500 or 600 pounds. Only one specimen was obtained in a condition for preservation. This was a small one 20 inches long. The species was found by Dr. Gilbert at Mazatlan, Panama and Punta Arenas: the type of *quinquefasciatus* were obtained by Dr. Bocourt at Tauesco.

This species seems to agree fully with the account of *Promicrops guttatus*, given by Gilbert & Swain, in 1884. There is not much doubt of the identity of the Pacific Coast *Promicrops quinquefasciatus* with *Promicrops guttatus* of the Atlantic.

108. **Dermatolepis punctatus** Gill.

This species seems to be rare along the coast. The type was found by Mr. Xantus at Cape San Lucas, another specimen was brought by Lieut. Nichols from Socorro Island, and a third was found by Dr. Gilbert about the islands near Mazatlan. It was found in abundance by Dr. Gilbert about the Revillagigedos.

109. Mycteroperca boulengeri Jordan & Starks, n. sp.
CABRILLA RAIZER. "MANGROVE GROUPER."
Plate xxxviii.

This species is found with *Mycteroperca jordani* Jenkins & Evermann in about equal abundance. It reaches a much smaller size than any other species of *Mycteroperca*. It is in many ways an aberrant form, showing affinities with *Epinephelus*. The anal fin is short, as in *Epinephelus*, while the general appearance and coloration is that of *Mycteroperca*. The structure of the skull shows that its affinities are with the latter.

Head $2\frac{4}{5}$ in length; depth $2\frac{5}{6}$. Dorsal XI–14 or 15; anal III–9 or 10; scales about 90, 20 above and 42 below; snout $3\frac{1}{2}$ in head; maxillary $2\frac{1}{5}$; eye $5\frac{1}{2}$; pectoral $1\frac{3}{4}$; ventral $1\frac{5}{6}$; longest anal ray $1\frac{2}{3}$; caudal $1\frac{3}{5}$; longest dorsal spine $2\frac{1}{2}$; gill-rakers short, about $6+17$, the longest about $\frac{3}{5}$ eye; longest dorsal ray 2 in head; length 10 inches.

Body short and deep, compressed. Head moderate, compressed, its profile not steep, nearly straight, a depression before eye. Upper canines moderate, the lower quite small. Nostrils small, well separated, the anterior slightly larger. Lower jaw very strongly projecting. Maxillary reaching opposite posterior edge of pupil. Preopercle slighily notched, the angle slightly salient, with enlarged teeth. Dorsal not deeply notched, the fourth spine not much elevated. Second dorsal high, not long, its angle not rounded. Caudal scarcely lunate, the upper lobe long, the lower truncate. Anal very high, strongly elevated; its posterior border incised, the anterior rounded. Pectoral and ventral moderate. Scales smoothish, not very small.

Color olive gray, covered everywhere with oblong irregular markings of black, between which the ground color forms rivulations. Gray lines radiating from the eye. A black blotch below maxillary. Pectoral olive yellow. Other fins blackish, clouded with pale. First dorsal with faint small black spots.

The supraoccipital and temporal crests are high, the supraoccipital crest extending to the posterior margin of orbit; the temporal crests are parallel to each other, and extending to pupil; interorbital space concave.

Several specimens, the largest (No. 1621, L. S. Jr. Univ. Mus.) one foot in length, taken in the Astillero at Mazatlan.

We take pleasure in naming this interesting species for Dr. George Albert Boulenger of the British Museum, in recognition of his excellent work on the *Serranidæ*, in the first volume of his Catalogue of the Fishes of the British Museum, the proof sheets of which have been kindly placed in our hands.

110. **Mycteroperca rosacea** (Streets). CABRILLA CALAMARIA.

Occasionally taken at Mazatlan in rather deep water. Three specimens only of this species have been preserved: one of them from Mazatlan, collected by Gilbert; one, the original type, obtained by Dr. Streets at some point further northward in the Gulf of California, and the third sent to us by Señor Ygnacio Moreno after our return from Mazatlan. In all of these the life color seems to be bright orange.

111. **Mycteroperca venadorum** Jordan & Starks, n. sp. GARLOPA.

A very large species found in some abundance about the islands along the coast, in rather deep water. But a single specimen, weighing 75 pounds, was obtained by us, this specimen being a type of the species. We are told by Dr. George W. Rogers and others that specimens weighing 150 pounds are not uncommon. The specimen from which the species is described was taken by the explosion of dynamite outside in the deep water not far from the island called Isla Blanca.

Head $3\frac{1}{6}$ in length: depth $3\frac{1}{4}$. Scales, small, smoothish, about 130. Dorsal XI, 16: anal III, 11. Snout 3 in head: maxillary 2: eye 8. Gill-rakers 3+8: pectorals $1\frac{9}{10}$; 4th dorsal spine $3\frac{3}{5}$: longest dorsal rays 3: longest anal ray $2\frac{1}{5}$; caudal lobe $1\frac{3}{4}$: ventrals $2\frac{1}{4}$.

Body robust, not strongly compressed, the head large. Lower jaw much projecting. Posterior nostril three times diameter of anterior. Preopercle scarcely notched, its angle scarcely salient, its teeth a little enlarged. Gill-rakers short, thick, few in number. Dorsal deep notched, 2d spine a little lower than the 4th. Soft dorsal high, slightly angulated. Anal very high, with exserted rays. Caudal well forked, lobes unequal.

Color olive brown, almost uniform; no spots or bands. Dorsal, anal and caudal with broad black margin narrowly edged with whitish. Pectoral and ventral darker behind. Pectoral with pale edge.

The type, a specimen weighing in life seventy-five lbs., has been sent as a skin to the British Museum. Its length was 40 inches to base of caudal fin.

112. **Mycteroperca pardalis** Gilbert. CABRILLA PINTITA.

This species is said to be rather common at the Venados and other islands in the neighborhood of Mazatlan. A single specimen was obtained by us; a head was also found in the market. Dr. Gilbert tells us that he has seen salted specimens apparently of this species preserved by the fishermen at Guaymas, together with specimens of a very large species, probably our *Mycteroperca venadorum.*

Head 3 in length: depth 3⅒; dorsal XI, 16; anal III, 11. Scales 100, small, smooth, imbedded, difficult to count. Eye 6⅔ in head; maxillary 2½; pectoral 1⅔; longest anal ray 1¾; longest dorsal 2; longest dorsal spine 3½. Caudal upper lobe 1⅓; ventrals 2.

Body deep, robust; anterior profile rather steep and straight; lower jaw moderately projecting. Small canines in both jaws; preopercle with notch and a salient angle. Gill-rakers about 15+25, rather stout, the longest about 7½ in head; snout 3½. Posterior nostril oblong, 4 times as long as anterior. Dorsal spines low, the third and fourth but little longer than the last. Dorsal fin pointed behind; anal very high, triangular in form; anterior margin convex, posterior concave. Sixth soft ray very high, reaching far beyond tip of last, which is short; spines graduated. Caudal fin broad, on a broad peduncle, unequally lunate; upper lobe longer and broader than lower. Pectorals rounded.

Color olive gray, paler below, clouded with dark above. Everywhere covered with small roundish dark olive or bronzed spots so thick as to obscure the ground color; very close set on head and back, small and distinct, not larger than anterior nostril, growing larger and less thick-set below; posteriorly still larger, often half diameter of pupil, and tending to run together forming elongated blotches and vermiculations. Dorsal similarly spotted with spots which grow faint on soft rays; pectoral, anal and caudal like soft dorsal. All soft fins growing dusky toward margin. Soft dorsal, anal and caudal very narrowly edged with pale. Pectoral with broader pale margin; ventral like pectoral, pale edge narrower. When seen from back an appearance of about 10 very faint dusky cross-shades, probably very conspicuous in young.

113. **Mycteroperca jordani** (Jenkins & Evermann). CABRILLA DE ASTILLERO.

Common in the Astillero at Mazatlan, reaching a much smaller size than any of the three preceding, the largest among them not being more than two pounds in weight. It is not found about the rocks, but lives in abundance in the branches of the Astillero on the muddy bottoms below a growth of the mangrove bushes.

Head 2¾, depth 3⅕. D. XI, 15. A. III, 10. Scales 23–125–43. Gill-rakers 3+10, short, barely longer than pupil. Eye 6½ in head; snout 3⅔: maxillary 2⅓. P. 1⅘. V. 2. 4th D. spine 3. Longest soft ray 2¾. A. 2⅕. C. 1¾.

Body moderately elongate, compressed: profile anteriorly a little convex, depressed before eye. Mouth moderate, the lower jaw longer. Nostrils well separated, subequal. Preopercle scarcely notched, the teeth at angle scarcely enlarged. First dorsal low, scarcely notched, the fourth spine not elongate. Soft dorsal low and rounded. Caudal truncate or very slightly rounded. Anal high but not rounded, its posterior border not incised. Pectorals and ventrals moderate.

Color olive gray, with very obscure marks of darker olive in the form of diffuse dark clouds: lower parts pale olive. Pectorals yellowish green; other fins blackish, the soft dorsal and caudal narrowly edged with whitish. Sides of head with wavy blackish streaks: a black mustache behind maxillary; lower side of head clouded, lower lip greenish.

Several specimens, each about a foot long.

An adult specimen of the same species shows the following characters:

Head 2⅔ in length; depth 3¾. Dorsal XI, 17; anal III, 11. Scales 120. Snout 3¼ in head; maxillary 2;

eye 7½: pectoral 1¾: ventral $2\frac{1}{5}$: anal ray $2\frac{1}{5}$; caudal $1\frac{4}{5}$. Longest dorsal spine $2\frac{3}{5}$: longest dorsal ray $2\frac{3}{5}$. Gill-rakers short 3+8, not longer than pupil.

Body robust, rather elongate. Head large, low, its profile not steep, a depression before eye. Canines in both jaws, rather strong. Nostrils well separated, the posterior scarcely longer than anterior. Lower jaw strongly projecting. Preopercle slightly notched, the angle little salient. Dorsal rather deeply notched, the fourth spine not especially elevated. Second dorsal high and long, with rounded angles. Caudal slightly lunate. Anal high, but not falcate, its middle rays much elevated but not exserted; both outlines nearly straight.

Color olive almost black above, with four series of oblong blackish, cloud-like blotches along sides; these irregular in size, the largest twice length of eye. Fins all dark, clouded with darker. A little dark red on pectoral and on the lower edge of anal and caudal. Pale edge on dorsal, anal, and caudal very slight: none on pectoral. Cheeks and opercles clouded, the cheeks faintly reticulate, the lower parts grayish, faintly mottled. Inside of mouth pale.

114. **Mycteroperca xenarcha** Jordan.

One specimen, 22 inches long, from the Venados Islands.

Head 2⅔; depth 3. Dorsal XI, 16. Anal III, 11. Scales 25–110 to 115–50.

Body rather deep and compressed: head compressed, with rather short, sharp snout, which is 4 in head: profile steep and nearly straight. Mouth large, the maxillary reaching scarcely beyond eye, 2 in head. Lower canines small: upper canines (two in number) strong, scarcely directed forward. Eye small, 7 in head. Preorbital narrow, $\frac{3}{4}$ width of eye. Interorbital area convex, its width $4\frac{1}{2}$ in head. Nostrils small, the posterior scarcely the larger, separated from the anterior by one diameter. Angle of preopercle scarcely salient, but provided with coarser teeth; a small sharp notch above it. Opercular spine flat and divided into about six teeth at the end. Gill-rakers moderate 9+18. Scales moderate, scarcely ctenoid. Dorsal spines low, the outline of the spinous dorsal gently convex, the fourth spine longest, 3 in head. Soft dorsal high, its outline angular, the tenth ray produced, $1\frac{5}{6}$ in head. Anal fin formed as in *Mycteroperca falcata*, its seventh ray produced and falcate, $1\frac{4}{5}$ in head, its posterior outline concave. Caudal subtruncate, the outer rays slightly produced. Pectoral $1\frac{3}{4}$ in head.

Color plain dark olivaceous, the edges of the fins scarcely darker; no evident markings on body.

115. **Paralabrax maculatofasciatus** (Steindachner).
CABRILLA PINTA.

Rather common at Mazatlan. This is one of the very few northern species which extends its range thus far to the southward. It is found in some abundance about San Diego, and its center of distribution is probably between Mazatlan and San Diego, these two places being the limits of its range, so far as now known.

116. **Diplectrum radiale** (Quoy & Gaimard).

This small species is about a foot in length and is generally common on the Coast. It is apparently not very abundant at Mazatlan, the few specimens seen by us being all taken in the Astillero.

Much cherry red on head and fins in life, sides salmon color, streaks on head greenish.

117. **Prionodes fasciatus** Jenyns.

Generally common in rocky islands on the Coast. Obtained by Gilbert from the islands about Mazatlan, whence it was described as *Serranus calopteryx*. Not taken by us.

Serranus bulleri, lately described by Dr. Boulenger from Las Peñas, Jalisco, seems to be identical with *Prionodes fasciatus*.

118. **Rypticus xanti** Gill. JABON.

This species was found by Gilbert in some abundance at Mazatlan. It was not seen by us.

Family CENTROPOMIDÆ.

119. **Centropomus viridis** Lockington. ROBALO.

A common and valued food fish at Mazatlan, where it was also taken by Dr. Gilbert.

This Pacific Coast fish seems to be really a species distinct from *Centropomus undecimalis*, with which it has hitherto been identified. The only differences we find are these: In *Centropomus viridis* the anterior appendages to the air-bladder are two to three times diameter of orbit (in *C. undecimalis* not longer than orbit), and the third anal spine projects beyond second. In *C. undecimalis* the second spine is the longer.

Color in life olivaceous, the sides dull silvery, a very little yellow on ventral, none elsewhere; ventrals not black.

120. **Centropomus nigrescens** Günther. ROBALO PRIETO.

Rather common; a food fish of some importance, reaching a length of about two feet, less common than *Centropomus viridis*. Recorded from Chiapam by Günther, and from Mazatlan, Panama and Punta Arenas by Gilbert.

121. **Centropomus pedimacula** Poey. ROBALITO, OR CONSTANTINO DE LAS ALETAS PRIETAS. (*Centropomus medius* Günther.)

Rather common, reaching a length of a little more than a foot; found at Chiapam (Günther), San Blas (Nichols) and Punta Arenas (Gilbert).

We find but one difference between the Pacific form called *Centropomus medius* and its Atlantic analogue, *Centropomus pedimacula* Poey. In the Pacific specimens, *Centropomus medius*, the second anal spine is curved and 1½ to $1\frac{3}{5}$ times in head. In *Centropomus pedimacula* it is straightish and longer, 1¼ to 1⅓ in head. This difference is of very doubtful value, and for the present we place *medius* in the synonymy of *pedimacula*.

Color greenish, the sides bright silvery. Ventral pale yellow, black at tip, a little yellow on anal, none elsewhere. Upper fins dusky; dusky on anal behind the spine.

122. **Centropomus robalito** Jordan & Gilbert. CONSTANTINO, OR ROBALITO DE LAS ALETAS AMARILLAS.

Rather common in the estuary and freely ascending the fresh waters, numerous specimens being taken by us in various places in the Rio Presidio. The species was found by Gilbert at Mazatlan and at Panama; it is probably generally common along the coast.

At our request, Dr. Evermann has compared specimens of the Pacific form called *Centropomus robalito* with *Centropomus ensiferus* from Cuba. He is unable to find any differences, and probably the two are identical. *Centropomus armatus* Gill from Panama is, however, distinct from *ensiferus* or *robalito*.

Olivaceous with bluish reflections; sides silvery, brightest above; ventrals bright yellow, not black at tip. Anal more or less bright yellow; upper fins dusky.

Family LUTIANIDÆ.

123. **Hoplopagrus guntheri** Gill. PARGO COCONACO.

This beautiful and most interesting species is very common about Mazatlan in deep water among the islands. It reaches a considerable size, the largest specimen seen by us having a length of 26 inches. There is considerable difference between the young and the old in coloration, the bands so conspicuous disappearing with age. The species has been found in abundance at Cape San Lucas, Altata and Guaymas, but has not been noticed further south.

Adult greenish above, belly coppery pink; head olive, sides with eight cross bands of warm brown, unequally placed; fins dusky olive shaded with pinkish and brown; ventrals black tipped. A dark crescent at base of pectoral.

124. **Lutianus novemfasciatus** Gill. PARGO PRIETO. PARGO MAREÑO.

This species reaches a much larger size than any other members of the genus on the Pacific Coast, those specimens obtained by us with dynamite among the Venados Islands having a weight of about twenty-five pounds. It is a food fish of some importance. It undergoes very considerable changes with age, as the notes below will show. The young are dark in color, the bodies banded and the amount of red very slight. The adult becomes uniformly colored with much red, and with increased age there is a progressive lengthening of the snout and widening of the preorbital.

Description of adult of 30 inches: Head 3: depth 3 (3⅓ in young); dorsal X, 14: anal III, 18: scales 6 (4)–50–13: eye 6½ in head: snout 2½: maxillary 2⅖. Pectoral 1¼. Ventral 2. Anal 3: 3d anal spine 5¾:

caudal $1\frac{3}{4}$: preorbital $3\frac{5}{6}$ ($4\frac{1}{3}$ in smaller specimens 20 inches long; 5 in those of one foot long).

Body very robust, not much compressed, the back not sharp. Head very large, the mouth very large, reaching middle of eye. Canines very strong, in front of jaw and on sides of lower. Vomerine teeth in a V-shaped patch, not prolonged behind. Gill-rakers 7, very small, the longest less than pupil. Posterior nostril oblong, much longer than anterior. Preopercle slightly notched: 7 or 8 rows of scales on cheeks.

Dorsal deeply notched, rather low. Soft dorsal low and rounded. Anal low and rounded. Pectoral long and pointed. Caudal short, scarcely concave. Anal spines short, graduated. Scales above lateral line not in a parallel series.

Maroon color above, copper red below, becoming salmon color before. Fins blackish, tinged with maroon. Pectoral dull yellow olive, blackish at tip: a blackish cross spot on base of pectoral, growing faint with age. Inside of the mouth salmon. Ventral quite dark, the tips black. Iris salmon color; no blue spots or line below eye.

Young with spinous dorsal edged with black; anal and caudal black; ventrals black tipped. A black crescent on upper part of base of pectoral.

Young of one foot, black with progressively less red and narrow preorbital. Color largely blackish, tinged with copper on belly and lower parts.

The young are called Pargo Negro; the half grown, Pargo Prieto; the adult Pargo Mareño, or Maroon Snapper.

125. **Lutianus argentiventris** (Peters). PARGO AMARILLO.

Very abundant everywhere about Mazatlan, and probably common all the way from Guaymas to Panama. It reaches a weight of about five pounds, and is a food fish of some importance.

Back olivaceous, anterior parts washed with maroon red, bright on sides of head, becoming more orange posteriorly; posterior half of body bright yellow; some pale streaks on scales. Pectoral light orange red. Other fins mostly bright yellow. A row of round blue spots below eye. Belly silvery, slightly washed with red; inside of mouth white; iris white.

126. **Lutianus colorado** Jordan & Gilbert. PARGO COLORADO.

This large, handsomely colored species, is one of the staple food fishes at Mazatlan, being brought into the market every day, both from the estuary and from the deep water about the islands. It reaches a weight of about ten pounds. Thus far it has been recorded only from Mazatlan and Punta Arenas, all the known specimens having been collected by Dr. Gilbert.

127. **Lutianus guttatus** (Steindachner). PARGO FLAMENCO.

This small, beautifully colored species, is generally common about Mazatlan, and probably in all the localities along the coast; it is found both in the estuary and in the neighborhood of the rocks. It rarely reaches a pound in weight.

Light olivaceous above, the markings bronze olive; sides pale crimson, the marks more yellow. Belly golden yellow. Scarlet on iris, yellow about eye; first dorsal reddish, second with reddish brown markings; caudal deep rich red; lower fins golden; pectoral nearly colorless; side of head pink with golden stripes.

128. **Lutianus aratus** (Günther). PARGO RAIZERO.

This beautiful species is not very abundant about Mazatlan, specimens being only occasionally taken. It rarely reaches five pounds in weight. It is generally distributed along the coast, having been recorded from Punta Arenas by Gilbert, and from Chiapam and Panama by Günther.

Dark green, the dark stripes on sides dark brown, the interspaces yellowish white; belly coppery red; some bluish on cheek; pectoral maroon red; ventrals salmon red, the first ray white; anal creamy red; caudal dark red, blackish towards tip; dorsals dusky; throat silvery.

129. **Rabirubia inermis** (Peters). Plate XXXIX.

The original type of this species in the museum at Berlin was said to have been brought from Mazatlan. A single specimen from Panama is in the museum of Stanford University. In this species the supra-occipital crest is continued forward on the head to the ethmoid region, as in the genus *Ocyurus*. This character widely separates *inermis* from the genus *Lutianus*. The genus *Rabirubia* Jordan & Fesler, of which it is the type, is separated from *Ocyurus* chiefly by the small number of the gill-rakers.

Family HÆMULIDÆ.

130. **Hæmulon sexfasciatum** Gill. RONCADOR ALMEJERO.

This species reaches a larger size than any other of the group, none that were found by us being less than two feet in length. It is not very common, living mainly about the islands. It was obtained by Peters and Gilbert at Mazatlan, and ranges from Cape San Lucas to Panama.

131. **Hæmulon scudderi** Gill. RONCADOR PRIETO.

This species reaches a length of about fifteen inches, and is very common at Mazatlan, more so than any other member of the group. Large specimens were taken by dynamite in the deep water about the Venados, and the young are rather common in the estuary. The species seems to have indifferently eleven or twelve dorsal spines, and there is a greater variation than usual in the form of the body and in the shade of coloration. There seems to be no doubt, however, that all the forms usually referred to this species belong to a single one. The species is found from Cape San Lucas to Panama.

Back bright yellow-olive to opposite front of soft dorsal, the posterior half, more or less abruptly, steel blue black. The vertical fins all blackish; in some the whole back is greenish, in others only half; lower parts all gray; most of the large ones show no traces of spots on scales, some show a few spots; fins silvery, with golden above and below; mouth red within; black under preopercle.

132. **Hæmulon steindachneri** (Jordan & Gilbert). RONCADOR RAIADO.

This small species, not reaching a length of more than eight inches, and too small to be regarded as a food fish, is very abundant in the harbor at Mazatlan, especially about the wharf and in the quiet waters in the estuary. It is generally distributed along the coast from Guaymas to Panama. It seems to be indistinguishable from a species found along the Brazilian coast and north to St. Lucia. For this species we have formerly taken the name of *Hæmulon schranki* Agassiz. This identification is probably an error. *Hæmulon schranki* is probably based on a faded example of *Hæmulon melanurum*. Apparently the appropriate name of *Hæmulon steindachneri* should stand.

Fins all golden yellow; body dark bronze, with rows of pearly blue spots; a large black blotch at base of caudal.

133. **Lythrulon flaviguttatum** (Gill). (*Hæmulon margaritiferum* Günther.)

This species is not very common in the estuary at Mazatlan, a few specimens having been taken by Dr. Gilbert. It is widely distributed along the coast from Guaymas to Panama.

134. **Lythrulon opalescens** Jordan & Starks, n. sp. Plate xl.

Rather common in the estuary at Mazatlan, not yet noticed elsewhere; all the specimens of *Lythrulon* from other localities examined by us being referable to *Lythrulon flaviguttatum*.

Head $3\frac{1}{2}$; depth $2\frac{2}{3}$; dorsal XII, 16; anal III, 9; snout $3\frac{2}{3}$ in head; maxillary reaching slightly past front of pupil, $2\frac{1}{2}$ in head; orbit $2\frac{5}{6}$; interorbital $3\frac{2}{3}$; longest dorsal spine 2; longest dorsal ray 4; second anal spine $2\frac{1}{2}$; pectoral $1\frac{1}{16}$; ventrals $1\frac{1}{2}$; scales 7–54–13.

Body deep, compressed, the back well elevated, the dorsal outline nearly uniformly curved from tip of snout to caudal peduncle; ventral outline curved from chin to breast, thence straight to anal spine, and slanting obliquely upwards to caudal peduncle.

Snout small and pointed; mouth small and oblique, the lower jaw slightly projecting; teeth all small, the outer scarcely enlarged; preopercle finely serrate, the posterior limb somewhat concave, the angle broadly rounded.

Gill-rakers short and slender, about half the diameter of pupil, $8+15$; scales above lateral line arranged in oblique series; tip of snout, chin and maxillary naked; scales on head small and crowded; soft fins scaled.

Pectoral reaching to vent; ventrals reaching half way to second anal ray; second anal spine a little longer and stronger than third; upper lobe of caudal the longer, about equal to head.

Color as in *Lythrulon flaviguttatum*, in spirits, dark steel gray; a small very distinct pale spot on each scale of back and sides, surrounded by darker. This spot is, in spirits, light yellowish; in life of a pearly blue. Head plain; a small dusky blotch under angle of preopercle. Fins plain bright yellow in life. Young with a large black blotch at base of caudal, as in *Hæmulon steindachneri* and *Orthostœchus maculicauda*, and without the dusky horizontal streaks seen in most of the other species.

This species differs from *Lythrulon flaviguttatum* in having fewer gill-rakers, the depth and arch of the back greater.

Described from a specimen (No. 2963, L. S. Jr. Univ. Mus.) 9 inches long. Two others were obtained.

135. **Orthostœchus maculicauda** Gill.

This small species was not found at Mazatlan either by Dr. Gilbert or by the Hopkins expedition. Specimens from Mazatlan and from Acapulco have been recorded by Steindachner. It was obtained by Xantus at Cape San Lucas and Colima, and by Dr. Gilbert at La Paz and Panama.

136. **Anisotremus interruptus** (Gill). MOJARRON.

This large species occurs in great abundance about the islands near Mazatlan, many specimens, the largest over two feet in length, having been obtained by dynamite. It is occasionally seen in the Astillero. It is widely distributed along the coast, and specimens were obtained by Dr. Gilbert in 1881 at Mazatlan.

Body grayish anteriorly, most specimens gray before, yellow on posterior half; the back tinged with brassy olive, which grows darker behind, the posterior parts pretty distinctly yellow; fin spines gray, the soft fins olive, the fins growing dusky at tip; scales on back and sides each with a distinct black spot; iris yellow; scales above lateral line much enlarged, 4 in number, 7 in an oblique series; 52 pores.

The generally larger size of the scales above the lateral line may possibly separate this species from the common Atlantic form, *Anisotremus surinamensis*.

137. **Anisotremus cæsius** (Jordan & Gilbert).

This species is known only from two or three specimens obtained by Dr. Gilbert in 1881 from Mazatlan. It was not seen by us, and is doubtless rare.

138. **Anisotremus dovii** (Günther).

This species was found by Gilbert at Mazatlan and Panama, but no specimens were obtained by us.

139. **Anisotremus tæniatus** Gill. CATALINA.

This species is rather common about the islands. It reaches a length of about 18 inches, and in life is very brilliant in color. It is seldom found in shallow water. It ranges from Magdalena Bay to Panama.

140. **Pomadasis macracanthus** (Günther). BURRO.

This species is extremely common everywhere about Mazatlan. It is a food fish of some importance, but the flesh is rather coarse. It reaches a length of about 18 inches. When taken from the water it makes a loud and singular noise extremely similiar to the noise made by the donkey or burro, from which this species receives its common name. Every species of the genus makes some noise, but in no case is it so loud as in this one.

141. **Pomadasis branicki** (Steindachner).

This small species, rarely exceeding six inches in length, was found by us in some abundance in the Astillero at Mazatlan. It was obtained by Gilbert both at Mazatlan and Panama. Steindachner described it from Tumbez on the coast of Peru.

142. **Pomadasis panamensis** (Steindachner).

This species is generally common along the west coast, but it was not seen by us. Dr. Gilbert found it both at Mazatlan and Panama.

143. **Pomadasis axillaris** (Steindachner). BURRO BLANCO.

This species reaches the length of about a foot, and is occasionally taken at Panama; a single specimen being found by us at Mazatlan. Both Steindachner and Gilbert also record it from Mazatlan, and a single specimen has been found by us in the collection of Dr. Streets from the coast of Lower California. It has not been noticed from any other locality.

144. **Pomadasis nitidus** (Steindachner).

This species was found at Mazatlan by both Steindachner and Gilbert, but it was not seen by us. Gilbert records it also from Panama.

145. **Pomadasis leuciscus** (Günther). BURRITO.

This small species seldom exceeds a length of six inches, and is generally common in the bay at Mazatlan, and on sandy bottoms where the water is shallow. We found large variations in the depth of body, in the width of the preorbital and in the length of the anal spines, but in no case have we been able to make these variations agree exactly with any of the differences by which we have hitherto distinguished *Pomadasis elongatus* (Steindachner) from *Pomadasis leuciscus* (Günther). We have reached the conclusion that all of these forms belong to one species, and that *elongatus*, as we have understood it, cannot be maintained as a separate species. The two supposed forms have been recorded from various places between Guaymas and Panama. The name *elongatus* was first applied to a Peruvian specimen, which is possibly different from *leuciscus*, as we have seen none exactly like Steindachner's figure.

The young show yellowish shades on fins. Second dorsal mottled with blackish; a diffuse dusky blotch on opercular angle, and evident dark streaks, three or four, along middle of sides.

146. **Orthopristis chalceus** (Günther).

This species is generally common along the coast from Guaymas to Panama. It was obtained by Steindachner and Gilbert at Mazatlan, but no specimens were secured by us.

147. **Isaciella brevipinnis** (Steindachner).

The original type of this species was obtained by Dr. Steindachner at Mazatlan. A specimen from Panama, now in the museum of Yale University, was obtained by Prof. Bradley. The species seems to be rare, and no specimens were secured by us.

148. **Microlepidotus inornatus** Gill. JOPATON.

Five specimens of this rare species, the largest about fifteen inches in length, were obtained by us with dynamite off the shore of the southernmost of the three Venados Islands.

In life, steel-blue, with stripes of bright bronze; upper fins with golden; caudal partly dusky; preorbital with vertically oblong spots.

Family SPARIDÆ.

149. **Calamus brachysomus** (Lockington). MOJARRA GARABATA.

This species is very common about Mazatlan, being a food fish of some importance and reaching a length of about fifteen inches. It was also obtained by Dr. Gilbert. Its range southward is not certain, but it is generally common in the Gulf of California.

Family KYPHOSIDÆ.

150. **Kyphosus analogus** (Gill). SALEMA.

This beautiful species is rather common about Mazatlan, both in the estuary and in deep water in the neighborhood of the islands. It was not found by Dr. Gilbert, and its range along the coast is not definitely distinguished from that of the following species, the two having been recorded as identical by authors who had seen but one. They were first properly distinguished by Jenkins and Evermann, who obtained both at Guaymas. The marked difference in color, however, does not appear in the description of Jenkins and Evermann, which was drawn from specimens preserved in alcohol.

Head 4: depth 2¼; dorsal XI, 14: anal III, 12; eye 4½ in head: snout 3; maxillary 3⅓: pectoral 1¾, equal to ventrals: longest ray of soft dorsal 3½; longest dorsal spine 2⅓; upper lobe of caudal as long as head.

Body compressed, elliptical: profile in some specimens evenly curved from tip of snout to dorsal, in others slightly produced before eyes and concave over snout.

Mouth small, horizontal; jaws equal: teeth in a single series, from 22 to 28 in each jaw; maxillary extending to the vertical from the front of eye. Snout, lower jaw and preorbital naked, head elsewhere with scales; 12 to 15 rows of scales on opercle: scales on body much crowded anteriorly; scales 13–76–20; all the fins, with the exception of spinous dorsal, entirely scaled.

Tip of pectoral sharply rounded; front of anal not greatly elevated, its longest ray 3 in base of fin, which is about equal to head; spinous dorsal higher than soft dorsal; upper lobe of caudal the longer.

Color, steel blue, brighter than in *elegans*, with bronze streaks along the edges or rows of scales, much brighter than in *elegans*. A broader gray streak bordered with bronze at base of soft dorsal. A large brassy spot in the axil, extending along shoulder girdle; a deep bronze stripe through eye, another back from angle of mouth; the two separated by steel blue; fins all blue black, with some bronze, especially on pectoral. Body more elongate than in *elegans;* the form more elliptical; the mouth less blunt, with fewer teeth; the scales smaller and more crowded anteriorly; the fins lower, especially the anal. Well separated from *Kyphosus elegans*, living chiefly in the rocks outside; rare in the bay. Largest specimen eighteen inches long.

151. **Kyphosus elegans** (Peters). CHOPA.

This species is rather common about Mazatlan, especially in the sluggish waters of the Astillero. Like the preceding, it reaches a length of about fifteen inches.

Head 3⅔; depth 2; dorsal XI, 12; anal III, 11; eye 4 in head; snout 3¼; maxillary 3⅕; pectoral 1⅗, equals ventral; longest ray of soft dorsal 2½; longest dorsal spine 2½; longest anal ray 2; upper lobe of caudal equals head.

Body ovate, compressed; profile rounded, slightly produced before eyes; concave over snout in some specimens, straight in others; a gentle curve from eyes to dorsal. Mouth small, horizontal, the jaws equal; teeth in a single series, about 36 in each jaw; maxillary extending to the vertical from anterior edge of orbit; snout, lower jaw and preorbital naked, head everywhere else scaled; opercles with 8 or 9 rows of scales; scales on body large, somewhat crowded anteriorly; scales 11–63–17; all the fins, except spinous dorsal, with scales to their edges, those on caudal exceedingly small.

Tip of pectoral sharply rounded, not reaching to tips of ventrals; ventral spine half as long as soft rays; anal spines short and stout, graduated; anal elevated in front and higher than soft dorsal; middle spines of dorsal the longest, about equal to highest rays of soft dorsal; upper lobe of caudal the longer.

Color grayish black, with paler centers to the scales; sides with large faint diffuse yellowish white spots; a little bluish and yellowish on sides of head; a yellow streak below lower part of eye. Vertebræ 9+16 or 10+15.

Family SCIÆNIDÆ.

152. **Cynoscion reticulatus** (Günther). CORVINA.

Generally common on the sandy bottoms about Mazatlan. An excellent food fish, very often brought into the markets, and reaching a length of nearly 3 feet. It was found by Dr. Gilbert at Mazatlan and is common south to Panama.

Caudal fin yellowish orange in life; inside of mouth deep orange yellow.

153. **Cynoscion xanthulum** Jordan & Gilbert. CORVINA ALETAS AMARILLAS.

Found in company with *Cynoscion reticulatus*, but rather less abundant and perhaps reaching a smaller size. It is also a food fish. It has thus far been recorded only from Mazatlan, where the original types were taken by Dr. Gilbert.

154. Larimus argenteus (Gill).

One large specimen obtained: also found in the Gulf of California and southward on sandy shores to Panama.

155. Larimus breviceps Cuvier & Valenciennes.

Specimens of this species were obtained by Dr. Gilbert at Mazatlan, Punta Arenas and Panama. None were seen by us.

156. Corvula macrops (Steindachner). VACUOCUA.

One fine specimen from the Astillero at Mazatlan.

Head 3½; depth 3; dorsal XI, I, 25; anal II, 9; eye 3½ in head; snout 4¾; maxillary 2⅙; longest dorsal spine 1¾; longest dorsal ray 2¼; second anal spine 2⅓; ventrals 1½; pectoral 1⅗; caudal fin 1½.

Body oblong, moderately compressed, not much elevated; dorsal outline uniform from tip of snout to caudal peduncle; ventral outline rounded from chin to breast, then straight to anal spine, then slanting obliquely upward to caudal peduncle.

Snout blunt, shorter than large eye; upper jaw slightly projecting, teeth small and sharp, in one or two irregular series in lower jaw, in several series in upper jaw, the outer row slightly enlarged; maxillary extending to posterior edge of pupil; chin with four large pores; edge of preopercle covered with skin, which is serrated on the edge.

Gill-rakers slender, 9+13; scales ctenoid on the body, cycloid on the head; scales 8–56–11.

Spinous dorsal a little higher than soft dorsal; first dorsal spine very short, second about 5 times longer, third twice as long as second, third, fourth, fifth and sixth subequal, the others rapidly shorter; first anal spine very small, the second many times longer and stouter, but shorter than soft rays; ventrals inserted behind pectorals and reaching beyond them; caudal truncate.

Ground color silvery, but so closely set with small dark brown points as to almost obscure the silver; sides with about four faint dark cross bands and with conspicuous black stripes following the rows of scales, about 11 horizontal stripes below lateral line, those above slanting obliquely upward anteriorly, but becoming horizontal posteriorly, tips of ventrals and anal black, other fins dusky.

Described from a specimen 8 inches long.

157. **Bairdiella icistia** (Jordan & Gilbert).

This pretty species is not rare in the Astillero at Mazatlan, where specimens were obtained by Dr. Gilbert and by us. It has not been noticed elsewhere.

158. **Ophioscion scierus** (Jordan & Gilbert).

The species was obtained by Dr. Gilbert at Mazatlan; not seen by us. It is more common southward, having been taken by Dr. Gilbert at Punta Arenas and Panama.

159. **Micropogon ectenes** Jordan & Gilbert. VERRUGATO.

This species is a rather common food fish about Mazatlan, reaching a length of 18 inches. Numerous specimens were obtained both by Dr. Gilbert and by us. It has not been noticed at any other locality.

160. **Umbrina xanti** Gill. CODORNIZ.

This species is very common about Mazatlan, reaching a length of 15 inches, and being frequently brought into the market. It is generally common along the coast.

161. **Umbrina dorsalis** Gill.

This species seems to be scarce at Mazatlan, where a few specimens were found by Dr. Gilbert mixed with those of *Umbrina xanti* Gill. No specimens were obtained by us. It has elsewhere been noted only at Cape San Lucas.

162. **Menticirrus simus** Jordan.

This species was described from specimens obtained by Dr. Gilbert at Mazatlan. A single very small one was obtained by us in the surf north of the city.

163. **Menticirrus panamensis** (Steindachner).

Taken by Dr. Gilbert at Mazatlan; not seen by us.

164. **Menticirrus elongatus** (Günther). VERRUGATA.

This species is very common in the surf on the sandy beaches about Mazatlan. Specimens were also obtained by Dr. Gilbert. Elsewhere it has been recorded only from Chiapam, whence came Dr. Günther's original types.

Family GERRIDÆ.

165. **Eucinostomus californiensis** (Gill). MOJARRA CANTILEÑA. (*Diapteris californiensis* and *gracilis* Gill.)

Excessively common in the estuary, being by far the most abundant species, not excepting the White Mullet. It is rarely used as a food on account of its small size, its length when adult ranging from five to ten inches. The second interhæmal bone in this species is developed in a very singular manner, being short, much expanded and hollow, the broadly open upper end being occupied by the posterior part of the air-bladder, the structure being the same as in the genus *Calamus*, but more highly developed, the bone being shorter and more largely excavated. This structure is seen also in *Eucinostomus gula*, *harengulus*, and probably others. As *Gerres gula* (= *argenteus*) is the type of the genus *Eucinostomus*, this structure may be held to define that genus as distinct from *Gerres*. There can be no question as to its generic importance. In *Gerres* proper, the second interhæmal is long and spear-shaped, very much more slender in proportion to its length, not hollow and not receiving any of the air bladder. This structure is seen in *Gerres cinereus* (Walbaum), in *Gerres peruvianus* Cuvier & Valenciennes, and in *Gerres lineatus* Humboldt, as also in several West Indian species.

Eucinostomus californiensis is generally common along the west coast of Mexico, from Guaymas to Panama. It is probably, however, not found in the West Indies, the closely related *Eucinostomus harengulus* being apparently a different species. The specimens called *californiensis* by Gill, having the premaxillary groove semi-oval or ∩-shaped, seem to represent the adult of this species. Those called *gracilis*, with the premaxillary groove linear, are the young or half-grown. Still others, especially adults, have the premaxillary groove round, forming a pit, and every intermediate character may be found.

At first we thought it possible to separate *californiensis* and *gracilis* as distinct species. The careful re-examination of some 200 specimens leaves us wholly unable to separate them, as all grades of variation occur. Apparently the premaxillary groove is linear in the young, growing broader with age, but the changes very irregular. The name *Eucinostomus californiensis* has priority over *E. gracilis*.

NOTE.—The genus *Gerres* was established by Cuvier in the second edition of the Règne Animal, the name being based on seven species as enumerated by him, *rhombeus*, *oyena*, *aprion*, *poieti*, *lineatus*, *argyreus* and *filamentosus*. One of these species must, therefore, be chosen as the type of *Gerres*. In 1842, Ranzani established the genus *Diapterus* on *auratus*, a species closely related to *rhombeus*, or rather to the allied *olisthostoma*. In 1850, the name *Catochænum* was proposed by Cantor as a substitute for *Gerres*, regarded as preoccupied by the earlier name *Gerris*, applied by Fabricius to a genus of insects. The name *Catochænum* can only be used if *Gerres* is regarded as ineligible. By the rules followed by us, *Gerres* must be retained, being spelled differently from *Gerris*. In different publications of Poey, *plumieri* is made the type of *Gerres*, although it is not one of Cuvier's original species. Bleeker substitutes *Diapterus* for *Gerres* and *Catochænum*, specifying *plumieri* as its type, while Gill and Poey have used the name *Diapterus* for the allies of *gula*, to which the name *Eucinostomus* had been applied in 1855 by Baird and Girard. Although *plumieri* cannot be made the type of *Gerres*, it seems to us that the cognate species *lineatus* can be so regarded. If this view is adopted, the restricted *Gerres* of the present paper would correspond exactly with the restricted *Gerres* of Poey and Gill. This fact certainly justifies us in choosing *lineatus* as the type of the genus.

There can be no doubt of the generic value of *Eucinostomus (gula)* and of *Ulæma* Jordan & Evermann MS. *(lefroyi)*, as distinguished from *Gerres*. Of the other groups represented in American waters, *Xystæma* Jordan & Evermann MS. *(cinereus)* seems to be a valid genus, while *Diapterus (auratus)* should stand rather as a subgenus of *Gerres*. *Diapterus* differs from *Gerres* chiefly in the entire preorbital. *Xystæma* has the preopercle as well as preorbital entire, while *Ulæma* has the second interhæmal very short, and the two spines of the anal are themselves scarcely enlarged.

Moharra Poey *(rhombeus)* differs from *Diapterus* only in the presence of two anal spines instead of three, a character of low importance, as the relation of the species included in the two groups is very close.

The exotic genera of this group have not been studied by us.

The specimens recorded by Eigenmann from San Diego Bay as *Gerres cinereus* var. (Amer. Nat., 1891, 156) seem to be *Eucinostomus californiensis*.

166. **Xystæma cinereum** (Walbaum). MOJARRA BLANCA.

Very abundant at Mazatlan, being one of the staple food fishes, and reaching a length of nearly two feet; its flesh is of an excellent quality. The species was found by Dr. Gilbert at Mazatlan and Panama, and seems to be generally common along the coast. Like the rest of the genus, it occurs in shallow water on sandy bottoms, away from the surf.

167. **Gerres peruvianus** Cuvier & Valenciennes. MOJARRA DE LAS ALETAS AMARILLAS.

This small species is abundant at Mazatlan, although less common than *Eucinostomus californiensis*, and *Xystæma cinereum*. It rarely exceeds six inches in length.

Gerres brevirostris Sauvage, from Rio Guayas, near Guayaquil, is not evidently different from this species.

168. **Gerres lineatus** (Humboldt). MOJARRA CHINA. (*Gerres axillaris* Günther).

Rather common at Mazatlan, with the preceding, but reaching a rather larger size, from eight to twelve inches, and frequently used as food. It was found by Dr. Gilbert at Mazatlan, and has been recorded from Acapulco by Humboldt and Bradley, from San Blas by Nichols, and from Chiapam by Günther.

Family CIRRHITIDÆ.

169. **Cirrhites betaurus** Gill.

The young of this species, from two to six inches in length, are very abundant in rock pools about Mazatlan, where numerous specimens were obtained by us, as well as by Dr. Gilbert. These small specimens are identical with those obtained by Xantus at Cape San Lucas, the types of *Cirrhites betaurus.* It has been supposed that these are the young of *Cirrhites rivulatus* Valenciennes, abundant about the Galapagos and Revillagigedos, as no differences except those of color appear. The color differences are, however, strongly marked, and we are disposed to let *Cirrhites betaurus* stand provisionally as a distinct species. The coloration of *betaurus* has been well described by Dr. Gill; that of *rivulatus* is well figured by Dr. Günther.

First dorsal fin bright orange red in life; second reddish; cross bands on body black.

Family CICHLIDÆ.

170. **Heros beani** Jordan. Mojarra Verde.

Common in the deeper and more quiet places in the Rio Presidio, especially just below the village of Presidio. It reaches a length of about eight inches, and is occasionally taken by the hook, its habits being very similar to those of the abundant sun fishes as seen in the more northern waters.

Adult light olive, banded with darker; black spots on each scale. First dorsal edged with dark red, the two black blotches and black bars obsolete. Young with the bars distinct; no blue, yellow or red in life.

Family POMACENTRIDÆ.

171. **Eupomacentrus rectifrænum** (Gill). Pescado Azul. (*Pomacentrus analigutta* Gill.)

This beautiful fish is very abundant in the rock pools about Mazatlan. It is excessively wary and hard to catch. Great changes in coloration, due to age, have been noticed by Dr. Günther and others. The chief peculiarity is in the greater uniformity in coloration of the adult, in which the blue shades become obscure, and the ocelli, so conspicuous in the young, are more or less lost.

This species is exceedingly close to *Eupomacentrus fuscus* (Cuvier & Valenciennes), a species found on the Brazilian coast. Comparing specimens from Bahia with ours from Mazatlan, we note that in *E. rectifrænum* the blue markings persist longer and that the scales on the head are smaller, more crowded and more mixed with small scales in *E. rectifrænum* than in *Eupomacentrus fuscus.*

Head 3⅓; depth 2; D. XII, 13; A. II, 11; scales 3–28–9: eye 4 in head; snout 2⅗; D. lobe 1⅖: C. upper lobe 1⅖: V. 1⅓: P. 1⅛.

Preorbital and preopercle strongly serrate. Teeth firm, flattened, not notched. Lateral line ending under ninth dorsal ray. Caudal lunate, the upper lobe the longer. Dorsal and anal rounded, ventral filamentous. Gill-rakers short, slender, weak, numerous.

Color of adult (5½ inches) nearly uniform blackish olive, darker on head, back and fins, paler on pectoral and on axil, where is a yellowish area below the small axillary spot.

The coloration of the young and partly grown has been well described by Dr. Gill. Dr. Gill's last account (Proc. Ac. Nat. Sci. Phila., 1863) of this and related species is most excellent. The only error of importance contained in it is the failure to examine the teeth of "*Pomataprion*" *bairdii* and *dorsalis.* *Pomataprion* is identical with *Microspathodon.*

172. **Eupomacentrus flavilatus** (Gill). PESCADO AZUL DE DOS COLORES. Plate xlii.

This little fish is equally abundant with the preceding in rock pools. It seems to reach a smaller size. The differences between the two are comparatively slight but very persistent, and we believe that the two species are fully distinct from each other. In life *Eupomacentrus flavilatus* is the most beautiful fish found on the coast of Mexico, showing a most intense shade in the blue of its back and the orange of its sides. Both this species and the preceding were found at Cape San Lucas, but only *Eupomacentrus rectifrænum* has been taken at Panama.

An irregular line from snout below eye to soft dorsal divides the fish into two parts: below this line all is brilliant yellow with an orange shade, deepest on anal; above all is the brightest sky blue. Scales darker, but all edged with sky blue, six sky blue stripes on upper part of head. An indigo spot on base of first soft dorsal and last dorsal spines extending on back, this surrounded by a ring of sky blue; a similar smaller ocellated spot on back of caudal peduncle.

173. **Abudefduf* saxatilis** (Linnæus).

Common in rock pools about Mazatlan, where it was obtained in abundance by Dr. Gilbert and by us. The largest specimens were taken by dynamite off the Venados Islands.

Careful comparison of these specimens with others from the West Indies shows no difference whatever. *Glyphisodon troscheli* Gill, the name given to the Pacific Coast form, is therefore fully synonymus with *Abudefduf* (or *Glyphisodon) saxatilis.*

In life, bright greenish yellow above with steel blue bands. Dorsal like back; other fins dusky; axillary spot faint.

In alcohol, the color is a slaty brown tinged with reddish brown below, showing faint dark cross bars, with no bright color anywhere, the yellowish green of the back being last to fade; behind the pectoral each scale has a white spot, these form white lines that run back to a little past the tip of pectoral. All fins dark except pectoral, which is colorless.

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* *Abudefduf* Forskål seems to be identical with *Glyphisodon* and is entitled to priority, notwithstanding its barbarous form.

174. **Abudefduf declivifrons** (Gill).

This species occurs in rock pools in abundance everywhere about Maxatlan, in company with *Abudefduf saxatilis*, from which its duller color readily distinguishes it.

In life, dusky brownish with many pale spots on edge of scales; these vary a good deal; cross bands blackish; no bright colors. Black spot at base of pectoral conspicuous, a good mark, varying in size, larger in older specimens.

175. **Microspathodon bairdii** (Gill). Plate xliii.

Numerous small specimens taken in the rock pools in company with *Eupomacentrus flavilatus*, a species which the present one closely resembles in color, and which scarcely excels it in brilliancy. This species has been well described by Dr. Gill. It seems to reach only a small size, none of ours being more than two inches long.

It differs from the other species of *Microspathodon* in its low fins and in color. The latter may be a matter of age only, but this does not seem likely, as the young of *Microspathodon dorsalis* (called by Dr. Gill *quadrigutta*) has essentially the coloration of the adult. Apparently four species of *Microspathodon* exist on the west coast of Mexico, but it is possible that all are forms of one protean species, for which the earliest specific name is *dorsalis*.

Head 3; depth 2; dorsal XII, 16; anal II, 13; eye 2⅔ in head; pectoral 1¼; anal ⅛ longer than head; soft dorsal and anal lobes equal 1⅓ in head; caudal lobe 1¼ in head.

Body compressed, ovate: profile convex: mouth wide, lower jaw included: teeth in a single row and movable: gill-rakers small and numerous: head entirely scaled: scales on body large 3–30–9: scales running well up on fins: lateral line high, ending under last dorsal ray.

Color: Body divided into two parts by a line from the opercular flap to posterior end of soft dorsal, below this line it is rich, bright yellow, above it is sky blue, darker on head, with brilliant sky blue spots: a chain of these spots following the suborbitals below eye: a spot at angle of mouth, two converging lines of spots more or less run together from tip of snout to upper edge of orbit, each scale on nape with a spot and a few scattering spots on opercle: scales on upper part of body edged with dark: a dark spot on caudal peduncle anteriorly edged with sky blue: fins all more or less dusky except anal and ventrals, which are white and edged with black.

176. **Microspathodon dorsalis** (Gill). (*Pomacentrus quadrigutta* Gill.)

A single specimen 4 inches in length was obtained in a rock pool on the Peninsula called Vijía, by Mr. George B. Culver.

This specimen corresponds almost perfectly to Dr. Gill's account of *Pomataprion dorsalis.* A smaller specimen entirely similar was also obtained. The distinctions between this species and *Microspathodon bairdii* are constant though slight.

Head 3; depth $1\frac{5}{6}$; D. XII, 16; A. II, 12; scales 3–28–10; eye $2\frac{1}{2}$ in head; snout 4; D. lobe 1; C. lobe equals head; P. $1\frac{1}{6}$; V. equals head.

Body compressed, the profile rounded, depressed before eye so that snout projects. Gill-rakers numerous, very short, slender, close set. Preorbital deep. Preorbital and preopercle entire. Teeth in a single row, movable.

Dorsal spines rising to the last, subtruncate, flattened, each with a brown vertical streak in center; the soft rays and lobes of caudal much produced, as also ventrals.

Deep indigo blue on body and fins; no pale edgings to any of the fins; three round sky blue spots above lateral line, the one near its beginning, the one under front of spinous dorsal, the third under last spine, the first smallest, the other two as large as pupil; a larger sky blue saddle in axil of last soft ray. Head with many sky blue spots everywhere, those on preorbital and suborbital coalescing in a blue streak; another streak behind angle of mouth, and another above eye. Axil sky blue, a bar of sky blue across end of snout. Angle of snout sky blue.

177. **Microspathodon azurissimus** Jordan & Starks n. sp. Plate xliv.

A surpassingly beautiful little fish, obtained by dynamite from the rocks about the Venados Islands. Three specimens were taken, the largest twelve inches in length.

This species seems to agree fully with *Microspathodon dorsalis*, except in coloration, in the greater elongation of the lobes of the fins and in the greater depth of the preorbital and other bones of the head. All these latter may prove to be differences of age. The change in the coloration can hardly be of this nature. Another species of this type, *Microspathodon cinereus* Gilbert, has been described from Socorro Island. This is very close to *dorsalis* and *azurissimus*, but is of an ashy gray color and has a greater number of accessory scales on the large scales of its body. Pending investigation, we admit all four of these color forms—*bairdii*, *dorsalis*, *cinereus* and *azurissimus*—as distinct species, which they probably are, although the differences between *cinereus* and *azurissimus* may be derived from the character of the bottom, *cinereus* having been obtained from a bottom of volcanic ashes.

Head 3: depth 2: D. XII, 16: A. II, 13: eye 5 in head: snout nearly 2: pectoral 1½: highest dorsal spine 3 in body; ventral 2½ in length: anal lobe 2⅙: dorsal lobe 1¾ in body.

Body compressed and deep: dorsal outline from snout to caudal peduncle uniform: breast prominent and well rounded, behind which the ventral outline is straight to anal spine, then slanting obliquely upward to caudal peduncle. Mouth wide with thick lips: the teeth flat, sharp and movable, in a single row in each jaw, those in the upper jaw are arranged in a crescent, in the lower jaw they are in a straight line in front, but at the sides they describe nearly a right angle and run back: isthmus with a notch made by the prominence of the breast. Tip of snout, maxillary and lower jaw naked: head everywhere else with scales, the scales on cheeks in about 5 rows: scales on body large, 3–28–9: all the fins with scales. Accessory scales very few.

Lateral line running high and ending under last ray of soft dorsal: gill-rakers numerous, short and weak, about 5+21. Pectoral short and rounded at the tip: ventrals with the middle rays produced, 2½ times ventral spine, reaching past vent to anal; spinous dorsal low: with the exception of the first the spines are about equal: soft dorsal and anal falcate and filamentous, the dorsal lobe slightly the longer, not quite reaching to tip of caudal fin; caudal widely forked, the lobes falcate, the upper lobe the longer; the middle rays are contained 3½ times in the upper caudal lobe.

Specimens described twelve inches in length (Nos. 1610, 1636 and 2895, L. S. Jr. Univ. Mus.).

In life, deep indigo blue, with traces of olivaceous cross-shades. Pectoral, dorsal and caudal edged with bluish white. Eyes violet.

The species feeds on plants.

Family LABRIDÆ.

178. **Harpe diplotænia** Gill.

A single young female specimen was obtained by us at Mazatlan. This species is rare in collections, but is apparently not uncommon around the rocky islands. It has been recorded from Cape San Lucas by Xantus, and numerous specimens from the Revillagigedos have been taken by Dr. Gilbert. The form called *Harpe pectoralis* Gill is the male of the same species of which *Harpe diplotænia* Gill is the female.

179. **Pseudojulis notospilus** Günther.

This small species is common in rock pools about Mazatlan, where numerous examples, the largest about six inches long, were obtained by us. It was found in these pools by Gilbert, and has been recorded from Panama by Günther.

Coloration of adult blue green; bar across base of pectoral very bright: no dark spot behind eye; corners and tip of caudal pale, as in young. Each scale of posterior part of body with a small sky blue spot at tip: edges of scales bluish, the base olivaceous. Axil blue, golden behind. Breast and throat pale salmon color, with bluish streaks and shades; cheeks yellowish, snout blue. Young with blue spots more distinct, especially one behind eye. Adult with four dark shades on back extending on dorsal, the largest at front of soft dorsal: blackish spot diffuse, not ocellated. Caudal with faint bluish cross-streaks on faint bronze ground color, the angles broadly whitish; anal bronze with three bluish streaks, the tip pale. Ventrals dusky edged.

Young colored like adult but brighter, a paler olive streak from mouth across opercle above pectoral to base of caudal, this obsolete in adult. Dorsal unlike that of adult. First dorsal bronze with bluish cross-streaks, the large black blotch ocellated with blue and with a patch of bright yellow before and behind it. Interspaces between this and the two other, smaller black spots also bright light yellow.

180. **Halichœres dispilus** (Günther). Plate xlv.

This beautiful little fish was found to be rather abundant in the branches of the Astillero which cross Isla de las Piedras south of Mazatlan. Unlike most species of the group, it lives on the muddy bottoms, and is abundant about the roots of the mangrove, which border the muddy branches of the Astillero. It reaches a length of about six inches. A few specimens were also obtained in tide pools with sandy bottom.

Head $3\frac{1}{3}$: depth 4: dorsal IX, 11; anal III, 12: eye 6 in head: snout $3\frac{1}{3}$: maxillary $4\frac{1}{4}$: pectoral $1\frac{2}{3}$: anal 3; caudal fin 2.

Body slender and compressed: dorsal and ventral outlines similar; head pointed, the profile slightly convex: mouth small, the jaws equal; teeth in a single row: canines $\frac{2}{4}$ in front of jaws; at the posterior end of the premaxillary is a single strong, sharp tooth, pointing forward, and entirely below the angle of mouth. Lateral line high, following the curve of the back to the eighth dorsal ray, where it curves sharply down through two rows of scales, and then runs straight through middle of caudal peduncle to tail; pores of lateral line simple; scales large 2–27–10; head entirely naked; gill-rakers very small and pointed $6+7$. Dorsal spines slender but pungent; caudal slightly rounded, the upper angle slightly acute; ventrals short not filamentous; scales before dorsal in about six rows, not covering middle line.

Length of specimen described, five inches. Number 2904, L. S. Jr. Univ. Mus.

In life olive green, a bright blue streak, narrow and somewhat interrupted, from eye to base of caudal: a broader dark bronze streak just below it, containing a series of small dark spots, mostly arranged in threes, the last one darkest, at base of caudal, just above middle line, these obsolete in adult: below the bronze band, a faint blue streak, then a broad brown one, then a short one, bright sky blue bounding the belly, ending over the middle of anal; belly and throat pearl white. Head cherry red and bronze anteriorly, becoming olive in all specimens behind, mottled with blue: a dark blue edged spot behind eye; a large black spot smaller than eye below fifth dorsal spine, the spot crescent shaped, bordered with yellow behind, mostly on one scale. Iris red. A golden crescent at base of pectoral. Dorsal bright orange, bluish below. Caudal cherry red. Anal bright orange. No spots on fins. Larger specimens deeper in color, the head cherry red, a dark spot bordered with blue behind eye. Pectoral not black. In alcoholic specimens pearly streaks appear on sides of head and behind pectoral.

Found by Dr. Gilbert at Mazatlan. Specimens have also been obtained at Panama by Günther, and at Acapulco by Steindachner.

Our specimens differ somewhat in color from those described by Dr. Günther, especially in the hue of the head and caudal and in the presence of a black spot behind eye. They are, however, probably not specifically distinct.

181. **Thalassoma lucasanum** (Gill).

Obtained by Dr. Gilbert at Mazatlan: not seen by us. Also recorded by Mr. Forrer from Tres Marias, the original types taken by Xantus at Cape San Lucas.

Family SCARIDÆ.

182. **Scarus perrico** Jordan & Gilbert. PERRICO.

This large parrot-fish is rather common about the rocky islands near Mazatlan. A single specimen was obtained by us. The original type was found by Dr. Gilbert at the same locality. The fins of another specimen were found on the beach at La Paz by Mr. James A. Richardson.

Body olive brown. The markings, fins, teeth and spots on head all bright blue green.

Family EPHIPPIDÆ.

183. **Chætodipterus zonatus** (Girard).

Occasionally seen at Mazatlan, several specimens being taken by us in the Astillero. It was found by Dr. Gilbert at Mazatlan and Panama. The original type of the species came from San Diego, where no author subsequent to Girard has seen it. It is probably generally diffused along the coast, although less abundant than the corresponding species (*Chætodipterus faber* L.) is in the Atlantic.

Chætodipterus zonatus agrees with *Chætodipterus faber* in nearly all respects. The chief differences are that behind the great band from soft dorsal to anal in *Ch. zonatus* there are two other bands; one under middle of soft dorsal, the other at base of caudal, both distinct complete rings; no other bands. The third dorsal spine is not very high, being only about half length of head, and about twice height of the fourth. Dorsal VIII–I, 18; anal II, 16; scales 70. Long rays of soft dorsal and anal ¼ longer than head.

Family CHÆTODONTIDÆ.

184. **Chætodon humeralis** Günther. Muñeca.

Exceedingly common in the Astillero, especially on rock bottom. It reaches a length of about six inches, and is seldom used as food, although its striking color, which has suggested the name of *Muñeca* or doll, makes it an object of attention.

185. **Pomacanthus zonipectus** (Gill). Mojarra de las Piedras. (*Pomacanthus crescentalis* Jordan & Gilbert.)

Not uncommon in rocky places about Mazatlan. Two specimens were obtained by us with dynamite about the wreck of a French man-of-war in the Astillero. Smaller specimens, very different in color from the adult, and hence taken by us to be a distinct species (*Pomacanthus crescentalis*), were obtained by Dr. Gilbert at Mazatlan and Panama. The original type of the species was taken at San Salvador by Capt. Dow.

Description of the adult of *Pomacanthus zonipectus:*

Head 3⅔; depth 1¼; D. XI, 23; A. III, 20. Preopercular spine longer than eye, 3⅓ in head. Last dorsal spine 1½ in head. Longest dorsal ray $\frac{1}{5}$ longer than head, falcate. Anal rounded. Caudal short, truncate, 1¼ in head. Pectoral moderate. Ventral very long, ¼ longer than head. Preorbital equals maxillary, 1⅓ in head. Eye 3½ in head. Interopercle with one stoutish spine. Preopercle very finely serrate. A large hump at nape in adult.

Dark gray, blackish posteriorly, most scales with black centers; edges of scales, bright sky blue in life, especially posteriorly; a triangular bronze yellow patch in front of line connecting pectorals with ventrals, then a diffuse blackish bar from front of dorsal along region behind pectorals to ventrals, then a broad curved bar of yellow, obscured by blackish centers of scales: behind this a diffuse blackish area; breast vermiculated with blue and yellowish; a blackish bar covering most of head, behind which the opercles and nape are yellowish: jaws pale bluish; dorsal orange, vermiculate with sky blue, the edge bright sky blue, below which is orange; caudal orange, vermiculated with sky blue, the edge orange, the very margin blackish. Anal blackish, vermiculated with sky blue; pectorals light orange, marked with grayish blue. Ventrals largely blue-black, tipped with orange, the spine bluish.

Family TEUTHIDIDÆ.

186. Teuthis crestonis Jordan & Starks n. sp. BARBERO NEGRO. Plate xlvii.

Common in the Astillero and in rocky places about the islands. Also obtained by Dr. Gilbert in 1881 at Mazatlan and Panama. These specimens having been destroyed by fire, have never been described, and were provisionally and incorrectly referred to the West Indian species *Teuthis tractus (bahianus)*, from which this species differs in a few respects.

Head 3⅓; depth 1⅚; D. IX, 26; A. III, 24; snout 1⅔ in head; eye 3⅓: pectoral equal to head; caudal ⅕ longer than head; longest dorsal spine equal longest soft ray, 1½ in head; ventral 1⅕ in head.

Body deep and compressed, the anterior profile steep, convex before eye; caudal lunate, the upper ray ⅓ longer than middle one, ventrals very long.

Body slaty brown, mottled with gray but without bands; dorsal with a bluish gray band at base, then a bronze one, forking on soft dorsal inclosing a bluish gray band; five gray bands and four bronze ones on dorsal more or less distinct, especially in young; anal with five bluish gray and five bronze bands more oblique than those on dorsal and hence not continuous the whole length of fin; caudal peduncle black, a whitish yellow cross-band behind spine, faint in adult, the anterior margin vertical, the posterior concave: rest of caudal black. Pectoral yellowish; ventrals dusky, the spine black.

Adult with the pectoral quite yellow; pale band at base of caudal growing faint with age: a blue streak along base of dorsal.

Numerous specimens, the largest about six inches in length, numbered 2899, in the L. S. Jr. Univ. Mus.

187. **Xesurus punctatus** (Gill). COCHINITO. Plate xlvi.

Young specimens very abundant in rock pools about Mazatlan, hitherto known only from Cape San Lucas. It was not found by Dr. Gilbert at Mazatlan. Most of our specimens were secured by the use of the fish poison called gervo. By pouring this liquid into the rock pools at low tide this and several other species were obtained in numbers. This gervo or gerbo is the milky juice of a tree called *hava*, abundant in the forests about Mazatlan, and apparently allied to the *Strychnos nux-vomica*. In rock pools no specimens exceeding two inches in length were found. Several very large specimens were obtained with dynamite about the islands of Creston and Isla Blanca, where the species reaches a length of 16½ inches.

Description of adult:

Head 4: depth 2: dorsal VII, 26: anal II, 23; snout 1⅓ in head: eye 5⅓: pectoral long as head: ventral 1⅔; caudal 1⅙; second dorsal spine 2.

Body deep, compressed, covered with fine velvet. Caudal with three stout compressed blunt spines, with broad bases, the tips turned upward. Some specimens with no other spines: others with many spines, similar in form but much smaller, scattered over posterior half of body; most numerous about the other spines. Gill-rakers extremely small and weak. Caudal evenly lunate. Pectoral not falcate; anterior profile concave before eye then convex, the short conic snout projecting; lower jaw included. Preopercle obliquely placed, its bony edge slightly roughened.

Color in life olive green, slightly paler below, everywhere evenly covered with small round black spots, close-set and not confluent, the largest about equal to nostril. Caudal peduncle and fin abruptly bright yellow, unspotted. Other fins colored like the body and similarly spotted, the spots more sparse, the edges dusky with few spots. Large caudal spines whitish, their bases black; other spines all black.

Among the young two different styles of coloration were noticed, but all probably belong to the same species:

1. Specimens with the caudal yellow are more dusky, the dark spots much smaller and more distinct than in the others. Ground color of back light steel blue gray, lighter below head. Caudal canary yellow, clouded with dark at base, the yellow running forward on caudal peduncle.

2. Specimens with the caudal white have ground color lighter, more milky in general, much more silvery below eye, the silvery forming an irregular triangular patch on breast and opercle; caudal gray and white, black at base, white running forward slightly on caudal peduncle; dark spots on body forming pale reticulations, above lateral line white patches. Body deeper than in yellow-tailed specimens.

Both have the first dorsal and anal black at base, otherwise mostly white; white line bounding the back; dark bar from nape to eye: snout dusky; breast and opercles silvery.

This species is the type of the genus *Xesurus* Jordan & Evermann (MS.), distinguished from *Prionurus* by the armature of the caudal peduncle, as above described.

Family BALISTIDÆ.

188. **Balistes polylepis** Steindachner. Pez Puerco.

Generally common in rocky places on the coast from Magdalena Bay to Panama. Many specimens were obtained by us, the largest of them sixteen inches in length. It was found at Mazatlan also by Gilbert and by Steindachner.

189. **Balistes naufragium** Jordan & Starks n. sp. Pez Puerco de Piedra.

Four specimens obtained with dynamite, about the wreck of a French man-of-war in the Astillero at Mazatlan, in company with *Pomacanthus zonipectus*. The largest of these was fourteen inches in length.

Allied to *Balistes carolinensis*.

Head 3; depth $1\frac{4}{5}$; D. III–27; A. 24; scales 50; 12 rows on cheek; snout $1\frac{1}{4}$ in head; eye 5; 1st D. spine $1\frac{3}{5}$; longest ray $1\frac{1}{5}$; longest anal ray $1\frac{2}{3}$; upper caudal lobe $1\frac{1}{3}$; pectoral $2\frac{1}{4}$.

Body very plump, not strongly compressed; no streaks on cheeks; no spinules on caudal peduncle; a few larger scutes behind gill-openings; groove before eye, slight not naked. Lateral line traceable for most of its length. First dorsal spine very stout, the third remote, moderate. Dorsal moderately elevated and falcate. Anal rounded. Caudal double concave, the pointed outer rays longer than the rounded inner ones.

Dark dull olive green, nearly plain, edges of scales largely pale blue, especially toward the tail; faint traces of numerous dark cross-bands. Fins dusky olive, the pectoral and first dorsal paler, base of pectoral dusky.

Type No. 1656 L. S. Jr. Univ. Mus.

190. **Pachynathus capistratus** (Shaw). Coche.

Common in rocky places about the islands of the Venados, Creston and Isla Blanca; many specimens obtained. This species was found by Gilbert at Mazatlan, and by Steindachner at Cape San Lucas. We have thus far been unable to find any distinction between the American form and the common East Indian species, to which the name *capistratus* was first given. Two markedly different types of coloration were obtained, supposed by us to be of the two sexes, since no other difference except that of coloration is noticeable. In all specimens obtained, however, the sexual organs were so immature that the sexes could not be distinguished thereby.

Specimens supposed to be female dull olive with darker clouds; no yellow on posterior parts which are scarcely paler behind; fins all plain olive blackish; streak behind mouth light bluish, very faint, soon fading after death; lower lip blue, then golden, then a blue ring, then yellow, then bluish; upper lip livid, bluish above.

Others supposed to be male are in life dark olive clouded with darker; posterior part of body deep yellow, below median line; fins blackish; first dorsal bright olive yellow on membranes; green on caudal membranes, the rays black. Anal reddish. Streak behind mouth bright red in one specimen, whitish in another. Upper lip livid blue then orange, then golden, then livid blue or purplish, then orange, then crimson, then dark.

Still other specimens were marked with whitish shades instead of red.

Family TETRAODONTIDÆ.

191. **Spheroides annulatus** (Jenyns) var. *politus* Girard. Tambor.

Very common everywhere in the Astillero. Specimens entirely smooth, and those variously prickly, were obtained; prickly ones, both young and old, were found, but no very young which were smooth. There seems to be no specific difference recognizable among these. All of them, however, differ from specimens taken farther south in the larger size of the dark spots and in a somewhat greater tendency to smoothness of the body. All of these, smooth or rough, seem to belong to the form called *politus*, which is probably the northern form or representative of *Spheroides annulatus*.

192. **Spheroides lobatus** (Steindachner). Botete.

Rather common in the estuary with the preceding, reaching a smaller size, the largest seen not over six inches in length. The species was first described by Steindachner from Altata, but until its recent discovery in the Albatross collections it was confounded with *Spheroides angusticeps* (Jenyns), from which it is probably distinct, although the latter, entirely smooth and uniform dusky in color, may prove to be the adult form. In both species the two small black flaps on the shoulder are present, and in both the interorbital space is very narrow and concave. Specimens taken at La Paz by Mr. James A. Richardson are intermediate in color, but retain the prickles.

In life grass green, with maroon colored spots and markings.

Family DIODONTIDÆ.

193. **Diodon hystrix** Linnæus. Puerco Espino.

Very common about rocky places, especially among the islands, where it was also found by Dr. Gilbert. All specimens taken belong to the typical *Diodon hystrix*. *Diodon holocanthus*, if different, is unrepresented in our Mazatlan collections.

Family MOLIDÆ.

194. **Mola mola** (Linnæus). Pez Mola.

Found in the open sea from San Francisco to Mazatlan. It was seen at the latter locality by Dr. Gilbert, but not by us.

Family SCORPÆNIDÆ.

195. **Scorpæna mystes** Jordan & Starks, n. sp. Lapon. Plate lii.

Common in the Astillero, on the bottom. Very tenacious of life, and much dreaded by the fishermen from the poisonous sting of its dorsal spines.

Allied to *Scorpæna plumieri* Bloch, which species it represents on the Pacific Coast.

Head 2⅓; depth 3⅓; dorsal XII, 10; anal III, 5; scales about 30; orbit 6½ in head; maxillary 2; pectoral 2; highest dorsal spine 3½; second anal spine 3; caudal 2.

Body robust, not much compressed; interorbital space wide, not deeply concave, ½ wider than orbit; a pit between preorbital and eye, and a broad depression behind coronal spines; membranous flaps on preorbital, edge of preopercle, over nostrils and above eyes; preocular, supraocular, tympanic, coronal, occipital, nuchal and exoccipital spines present. Maxillary reaching to behind eye; lower jaw included; gill-rakers short and thick, about

3–6; head naked, with the exception of a few imbedded scales on preopercle and posterior part of opercle; scales on body large, many of them with membranous flaps.

Olive-brown almost black, marbled with light drab; opercular flap with pale edge; the fins much spotted and marbled, all except spinous dorsal, with white margin, more distinct in the young; caudal fin showing three indistinct cross-bars; axil jet black, with white spots.

Largest specimen fourteen inches long.

This species differs from *Scorpæna plumieri* in having a wider and flatter interorbital area; the lower jaw wider and more rounded in front; the knob at symphysis not so sharp and projecting; the pit behind coronal spines broader and not so deep, and the color darker.

This species was also obtained at Mazatlan by Dr. Gilbert, who identified it provisionally as *Scorpæna plumieri.*

Types numbered 1501, 1616, 1617, 2919 on the L. S. Jr. Univ. Mus. register.

196. **Scorpæna sonoræ** (Jenkins & Evermann).

This small species is not uncommon in the Astillero, where numerous specimens, none of them over three inches in length, were obtained. It has hitherto been recorded only by Jenkins & Evermann from Guaymas.

Gray above, the flaps pinkish, the bars blackish; lower parts pink, bright on ventrals and anal; axil orange, mottled with dusky; ventrals and pectorals black at tip, edged with pale. Middle rays of pectoral slightly divided at tip, not all of them being strictly simple.

Family TRIGLIDÆ.

197. **Prionotus horrens** Richardson.

Two small specimens, each about two inches long, obtained in the Astillero.

Family GOBIIDÆ.

198. **Philypnus lateralis** Gill. ABOMA DE MAR.

Common in the Rio Presidio and occasionally taken in the Astillero, especially where the fresh water soaks into it. The species is common in fresh waters along the coast, but has not hitherto been noticed at Mazatlan.

199. **Dormitator maculatus** (Bloch). PUÑECA.

Rather common in the Rio Presidio and also in the brackish waters about the estuary. The young occur in considerable abundance in the mud puddles left by the winter rains or by the high tides. It reaches in the river a considerable size, and is a food fish of some importance, said to be the most valuable in the Rio Presidio. It is generally common along the coast, as well as everywhere along the Atlantic side.

200. **Eleotris æquidens** Jordan & Gilbert. GUAVINA.

Rather scarce in the Rio Presidio, where only one young specimen was obtained by us. A few others were found in brackish waters or muddy places about the estuary.

Blackish everywhere, sides with faint whitish streaks, along rows of scales; a broad blackish lateral band occupying whole of side; back and belly paler; traces of faint dark cross-bands; caudal black, with a pale margin and some dark cross-shades; pectorals, dorsals and ventrals more or less barred with black; a whitish bar at base of caudal with a darker one before it. Scales 68; preopercular spine well developed.

201. **Cotylopus gymnogaster** (Ogilvie-Grant).

Recorded from streams about Mazatlan; not seen by us.

202. **Awaous tajasica** (Lichtenstein). ABOMA DE RIO.

Found in company with *Philypnus lateralis*, from which most fishermen scarcely distinguish it. It is rather less abundant in the river, and was not noticed by us in the Astillero. Elsewhere on the coast it has been recorded only from the river at San José del Cabo in Lower California, where it was found by Mr. Lyman Belding and more recently by Dr. Gustav Eisen.

Comparison with specimens from Havana shows no differences.

203. **Gobius soporator** Cuvier & Valenciennes. CAIMAN.

Found in abundance in all rock pools, ascending farther above the low-tide mark than any other marine species. It does not occur in fresh water. There seems to be no difference between these specimens and those from the Gulf of Mexico, where it is found everywhere in water not exceeding two feet in depth.

204. **Gobius sagittula** (Günther).

A few small specimens, not over four inches in length, found in the Astillero on muddy bottoms. It was also taken by Dr. Gilbert at La Paz, Mazatlan and at Panama. *Gobius longicauda*, described by Jenkins & Evermann from Guaymas, is no doubt the adult of the same species, as Dr. Gilbert has already indicated.

Head $4\frac{1}{3}$; depth $6\frac{1}{4}$; caudal $\frac{2}{3}$ longer than head; eye $3\frac{1}{2}$ in head; maxillary $2\frac{2}{3}$; snout $3\frac{1}{2}$; scales about 52, the first 37 very small; dorsal VI–13; anal 14; skull with a median lengthwise ridge; interorbital space narrow, channelled; skull somewhat broader behind; scales before dorsal minute; head naked; scales ctenoid, much reduced anteriorly; lower jaw short, included; no flaps on shoulder girdle; maxillary reaching to pupil; dorsal spines slender, some filamentous; caudal lanceolate; teeth sharp, rather small, the outer larger; lower jaw thin and flat, its acutish tip elevated.

Olive, speckled and marbled; side with five oblong black spots, the smallest at base of caudal; a black blotch on opercle; dark cross-bars under soft dorsal; head much mottled; dorsal speckled; caudal with ten zigzag cross-bars of dark specks; pectoral faintly barred; anal and ventral plain; a dark curved streak about yellowish base of pectoral; lower lip dusky; a blackish cross-blotch above gill opening.

In the adult, called *Gobius longicauda*, the caudal is much longer, but there is no other difference of importance.

205. **Gobius manglicola** Jordan & Starks n. sp.

One specimen found in the mud of the Astillero among the roots of mangrove bushes *(Rhizophora mangle)*.

Head 4¼; depth 5⅔; D. VI–12; A. 12; scales about 35, not to be exactly counted; caudal lanceolate, 2⅔ in body; pectoral about equal to head; dorsal spine slender, not filamentous, 1⅔ in head; eyes large, close together, the range partly vertical, the narrow interorbital deeply furrowed; no flaps on shoulder girdle; scales moderate, ctenoid anteriorly, becoming smooth behind; median keel on head slight; head naked.

Body long, compressed, the head depressed, the cheeks tumid; snout bluntly truncate; mouth large, the maxillary reaching the middle of eye, not produced backward, truncated behind, somewhat oblique, the lower jaw a little the longer; lower jaw flat; teeth strong, the outer in both jaws enlarged; cranium without median crest, abruptly widened behind eyes.

Color light olive mottled with darker; six oblong blotches of blackish on sides as in *Gobius boleosoma*, the last at base of caudal; dorsals and caudal finely checkered and barred with dark brownish orange and blackish; anal mottled; a dark shoulder spot; a dark bar before eye and one below eye; ventrals dusky, the edge pale.

The species seems nearest allied to *Gobius sagittula*.

One specimen, 1½ inches long, numbered 3095 on the L. S. Jr. Univ. Mus. register.

206. Garmannia paradoxa (Günther). Plate xlix.

A single specimen found on muddy bottom among the mangroves lining the estuary.

Head 3½; depth 4⅓; D. VI–11; A. 9; eye 4 in head; snout 4¼; pectoral 1⅙ in head; dorsal spine 1⅕.

Form of *Gobiosoma bosci*. Body compressed; head broad and depressed, with tumid cheeks; snout not very blunt, short, oblique-truncate; eyes rather large, high, the maxillary not produced, extending to their posterior margin; mouth large, oblique; lower jaw heavy, slightly projecting; teeth strong; gill-openings narrow, not wider than base of pectoral. First dorsal rather high, the first spine filamentous, reaching past soft dorsal; other fins low. Head and anterior half of body to front of soft dorsal naked; scattering scales coming in above, twelve rows of imbricated slightly ctenoid scales along median line of caudal peduncle and forward to middle of soft dorsal, the scaled area about as long as head, the upper parts better scaled than lower. No flaps on shoulder girdle.

Olivaceous with seven or eight dark cross-shades—two on head, one across gill-openings, one behind pectoral, and a broad one below soft dorsal; dorsals dusky, the filamentous ray pink; lower half of soft dorsal yellowish, upper dusky; lower fins black; caudal dusky; a dark speck at angle of opercle; skin everywhere punctate with black; a pale olive bar at base of caudal.

Skull without median crest. Interorbital space not concave. Head not very abruptly widened behind eyes.

One specimen 1½ inches long obtained. This specimen differs but slightly from Günther's account of *Gobius paradoxus*, a species which is the type of the genus *Garmannia* of Jordan & Evermann (MS.), distinguished from *Gobius* by the half-naked body. The genus is named for Mr. Samuel Garman, the accomplished ichthyologist of the Museum of Comparative Zoology at Cambridge, Massachusetts, in recognition of his important contributions to ichthyology.

207. **Aboma etheostoma** Jordan & Starks, n. gen. and n. sp. Plate I.

A single small specimen found in the mud on a shallow bottom in the Astillero.

ABOMA, new genus, allied to *Microgobius* Poey, distinguished by the large, ctenoid scales, which cover the body; head naked, rather long, pointed in profile, the mouth moderate, not very oblique; teeth rather strong. Dorsal spines more than six, none of them filamentous; soft dorsal and anal short; no flaps on shoulder girdle. Cranium with a slight median crest. The name *Aboma* is used by the Mexicans in Sinaloa as synonymous with goby. Besides the new species, *Aboma etheostoma*, which is the type of this genus, probably *Gobius chiquita* Jenkins & Evermann, and *Gobius lucretiæ* Eigenmann & Eigenmann, will be referable to it.

Head 3⅓; depth 5; D. VIII–11; A. 10; scales 26; longest dorsal spine 1¾ in head; eye 3; snout 4; maxillary 3.

Body long and low, moderately depressed and pointed forward. Scales large, ctenoid behind, none on head, those on nape and belly much reduced. Mouth moderate, terminal, moderately oblique; the maxillary reaching middle of pupil, jaws subequal or the lower a little the longer: teeth rather strong. No flaps on shoulder girdle. Cranium with a slight median crest. Interorbital ridge not hollowed out: skull not abruptly widened behind.

Color olivaceous, side with a very broad jet black lateral band, three times interrupted by silvery. Caudal white with four < shaped bands, growing progressively fainter behind. Pectoral mottled gray, with a jet black oblique crescent towards its base, surrounding a large yellow spot, side of head with four round gray spots separated by black, the largest below eye, with a black streak before it. First dorsal jet black; second mottled; the produced spine with yellowish. Ventrals and anal pale.

One specimen, 1⅛ inches long, in the Museum of the Leland Stanford Jr. University.

208. **Evermannia zosterura** (Jordan & Gilbert). Plate li.

Very common on sandy bottoms everywhere about the estuary, numerous specimens being dug out of the sand by Mr. Williams. It is seldom found much if any below the mark of low tide. It is a very handsomely colored species, the male being more strikingly marked than any other of our Gobies. The species has hitherto been known only from a single specimen taken by Dr. Gilbert at Mazatlan.

Head 3¼: depth 6: dorsal IV–15: anal 14: eye equals snout, 5 in head; pectoral 1⅔; caudal 1⅓.

Body compressed, profile convex: snout short, not very blunt: eyes high, the maxillary reaching to their posterior margin: mouth oblique, jaws equal. First spine of dorsal filamentous, reaching to middle of soft dorsal (male). Body entirely naked.

Body everywhere speckled with dots of dark-brown.

Male sometimes with traces of eight olive cross-bands. Fins very ornate, the dorsal and anal yellowish at base, then a broad median band of jet black, then a broad white margin. Middle of caudal yellow to the tip, with a black band above and below, and a white edge above and below this as in dorsal and anal: no bands on tail.

Female with dorsal filament short, reaching about to first soft ray. Dorsals and anal checkered with blackish: caudal faintly barred: all vertical fins with pale edgings, but without the black stripe of the males.

Family GOBIESOCIDÆ.

209. **Gobiesox adustus** Jordan & Gilbert.

Obtained by Dr. Gilbert in rock pools at Mazatlan. Rare and not found by us.

210. **Gobiesox erythrops** Jordan & Gilbert.

Found rare in rock pools at Mazatlan by Dr. Gilbert, who also records a specimen from Tres Marias. Not seen by us.

211. **Gobiesox zebra** Jordan & Gilbert.

Very abundant in rocky places at Mazatlan, especially among sea urchins. Numerous specimens were obtained by us, as also by Dr. Gilbert.

The coloration is quite variable, although the markings are rather constant. In general, light pink with markings of gray, blackish and olive; a distinct dusky blotch behind eye and a dark bar across caudal.

212. **Gobiesox eos** Jordan & Gilbert.

Found in rock pools at Mazatlan by Dr. Gilbert. Not recorded from any other locality.

Two specimens obtained by us from rock pools among echini. The bright cherry red coloration is distinctive and persists in alcohol.

Family OPISTOGNATHIDÆ.

213. **Opistognathus punctata** Peters,

The original type of this species was described by Dr. Peters from Mazatlan. It was also found by Dr. Gilbert at Panama, the two specimens mentioned being as yet the only ones known.

Family BLENNIIDÆ.

214. **Isesthes brevipinnis** (Günther).

This species was found to be rather common in rock pools at Mazatlan both by Dr. Gilbert and by us.

215. **Rupiscartes atlanticus** (Cuvier & Valenciennes.)

This species is very common in rock pools about Mazatlan, where it reaches a length of about six inches. It was found in numbers by Dr. Gilbert at Mazatlan, but has not been recorded from localities farther south. Mr. Charles H. Townsend found it at San Cristobal Bay, and Mr. John Xantus at Cape San Lucas. Thus far no difference has been found between these specimens and those from the West Indies.

Body liver brown, paler below. Fins mostly blackish; an orange area on upper edge of caudal; a yellow one tinged reddish below. Eye red posteriorly.

216. **Rupiscartes chiostictus** (Jordan & Gilbert).

Only the original types of this species found by Dr. Gilbert in the tide pools at Mazatlan have been recorded. It was not seen by us.

Family CLINIDÆ.

217. **Labrosomus xanti** Gill.

Very common at Mazatlan in rock pools with *Rupiscartes atlanticus* (Cuvier & Valenciennes), and reaching about the same size. It was also found by Richardson at La Paz and by Gilbert at Mazatlan. It has been recorded from Cape San Lucas by Xantus and from San Cristobal Bay by Townsend. The Pacific form called *Labrosomus xanti* seems to be scarcely if at all distinguished from the West Indian form, *nuchipinnis*, cognate to it. The only difference we have found is in the dentition of the vomer, and this may not be constant.

218. **Labrosomus delalandi** (Cuvier & Valenciennes).

Extremely common in rock pools at Mazatlan, where it was also found by Dr. Gilbert. It has not been noticed from any other locality on the Pacific Coast. Thus far we have not been able to distinguish it from *Labrosomus delalandi* of the coast of Brazil.

219. **Enneanectes carminalis** (Jordan & Gilbert) n. gen. Plate liii.

Four specimens, types of the species, were found by Dr. Gilbert in a rock pool at Mazatlan. A single small example was obtained by us.

The short chubby body, large rough-ctenoid scales, little rounded profile, and short fins distinguish this species sufficiently from *Tripterygion* Risso, and characterize the new genus *Enneanectes*, framed for it by Jordan & Evermann.

220. **Auchenopterus monophthalmus** Günther.

Several specimens taken in rock pools at Mazatlan. At low tide it is often left by the recession of the water, in which case it creeps about in the Corallina.

In this species the first dorsal is higher and better separated from the rest of the fin than in the California species, *Auchenopterus integripinnis*, and there are some constant differences in coloration.

Family FIERASFERIDÆ.

221. **Fierasfer arenicola** Jordan & Gilbert.

A single specimen found in the sand at Mazatlan by Dr. Gilbert. At first described as a new species, *Fierasfer arenicola* Jordan & Gilbert, and subsequently identified with the species which occurs in more or less abundance in the shells of the pearl oyster. It was not found by the Hopkins Expedition. According to Prof. Putnam, the West Coast species, *Fierasfer arenicola*, is not distinct from *Fierasfer dubius* Putnam, of the Florida Keys. We may, however, retain the former as distinct until comparison of specimens can be made.

Family BROTULIDÆ.

222. **Dinematichthys ventralis** Gill. Plate liv.

Found abundant in rock pools at Mazatlan, where specimens were taken reaching a length of about four inches. This fish has hitherto been recorded as extremely rare, and very few were obtained by Dr. Gilbert. This is one of the species that were brought from their hiding places by the introduction of the poisonous juice of the Hava tree into the water. It has been recorded from Cape San Lucas and Mazatlan.

Color in life, everywhere liver brown, the fins edged with whitish or pinkish.

Family PLEURONECTIDÆ.

223. **Syacium ovale** (Günther).

Occasionally taken in the Astillero at Mazatlan, where specimens were found by Dr. Gilbert and by us. It is more abundant at Panama. The broad-headed form called *Syacium latifrons* (Jordan & Gilbert), which has been supposed, perhaps wrongly, to be the male of this species, has been seen only at Panama.

224. **Citharichthys gilberti** Jenkins & Evermann. LENGUADO.

Very common everywhere in the Astillero, and also ascending the Rio Presidio in the fresh waters nearly as far as the village of Presidio. In fresh water the color is considerably brighter than in the sea, and these fresh water specimens correspond to those described by Jordan & Goss as *Citharichthys sumichrasti*. These seem to be, however, of the same species.

225. **Azevia panamensis** (Steindachner).

Common in the Astillero, reaching a length of about eight inches. The following is a count of the fin rays of nine specimens: D. 95, A. 75; D. 89, A. 67; D. 92, A. 71; D. 89, A. 71; D. 94, A. 74; D. 89, A. 71; D. 90, A. 72; D. 92, A. 71; D. 91, A. 72.

These specimens seem to be inseparable from *Azevia panamensis*.

226. **Etropus crossotus** Jordan & Gilbert.

Rather common in the Astillero with the preceding species, but reaching a smaller size, rarely exceeding four inches. On careful comparison of our specimens with others from Beaufort, Pensacola, Panama, and other localities, we are unable to find any differences. The color varies with the bottom, some being plain light brown, others are much mottled with lighter or with darker.

227. **Hippoglossina macrops** Steindachner.

This species was described by Steindachner from a specimen obtained at Mazatlan. We have not seen it.

228. **Paralichthys adspersus** (Steindachner).

Very common in the bay and Astillero at Mazatlan, and in fact everywhere on the coast from Guaymas and

La Paz to Panama and Callao. It reaches a length of about three feet, and is a food fish of some importance, most specimens, however, being much smaller.

Head 3½; depth about 2 in length of body; D. 73 (70 to 76); A. 57 (53 to 60); P. 12; V. 6; scales on lateral line about 106+8 with 35 dorsally and 36 ventrally.

Flesh firm. Body oblong, moderately compressed: mouth large, oblique, the mandible very heavy, slightly projecting: 4 canine teeth on each side of lower jaw in adult specimens, 8 in young, the two anterior teeth long; anterior teeth of upper jaw strong, but smaller than those in the lower jaw; the lateral teeth very small and close set. Eye small, shorter than snout, about 7 (6 to 8) in length of head; interorbital area, smooth, flattish, ⅔ width of eye. Scales cycloid, small anteriorly and larger posteriorly. Lateral line strongly arched anteriorly, arch about 3⅓ in straight part.

Gill-rakers of medium length, broad, retrose-serrate on inner side, longest about ⅔ length of eye, from 4+13 to 5+14 in number, counted in eight specimens; pectoral fin about as long as mandible, slightly more than half length of head. Dorsal low, anterior origin opposite anterior margin of eye; caudal barely double concave; caudal peduncle very strong. Anal spine obsolete; ventral fins small, inserted symmetrically. Fins all scaly.

Color—Large specimens are dark brown, with blotches on fins; small specimens are covered with pearly white and very dark brown blotches. The brown blotches are almost circular, larger and with less definite outlines near the center of the body, very dark and distinct on caudal.

Seven specimens were taken by the Hopkins Expedition in the estuary at Mazatlan, where they reach a length of 44 cm. Several specimens were also taken at La Paz.

These specimens seem to be identical with *Paralichthys adspersus*, described from Callao by Steindachner. The original types have on the average more gill-rakers than we find on our Mazatlan specimens, but this character is subject to variation, and no other distinction appears.

In one of Dr. Steindachner's types from Callao (11,417, Mus. Comp. Zool.) we find the gill-rakers longer, 6+17; depth 2½ in length; D. 67; A. 51; scales 120; arch of lateral line barely twice as long as high, nearly 5 in straight part; maxillary 2⅙ in head.

Mr. Garman has kindly examined for us six other specimens, with the following results:

"*Paralichthys adspersus* from Callao has gill-rakers—
7 above, as long as the eye;
17 below.
$\frac{5}{15}$ about ⅔ as long as the eye.
$\frac{7}{18}$ nearly as long as the eye.
$\frac{3}{14}$ about ⅔ as long as the eye.
$\frac{5}{15}$ about ⅔ as long as the eye.
$\frac{6}{17}$ near ¾ as long as eye."
—(Garman, in lit., May 3, 1895.)

Family SOLEIDÆ.

229. **Achirus mazatlanus** (Steindachner). LENGUADO DE RIO. (*Solea pilosa* Peters.)

Very abundant in the fresh waters of the Rio Presidio below the village, varying considerably in color, and somewhat in form. One specimen was taken in the brackish waters of the estuary.

230. **Achirus fonsecensis** (Richardson).

Two specimens found in the Rio Presidio with *Achirus mazatlanus;* not seen at Mazatlan.

231. **Symphurus williamsi** Jordan & Culver, n. sp. Plate lv.

Two specimens, the largest about 1½ inches long, were obtained by Mr. Thomas Marion Williams in tide pools with sandy bottom, in very shallow water, near the estuary at Mazatlan.

Head 4⅘; depth 3⅔; D. 93; A. 73; scales 92. Body slenderer than in *Symphurus plagiusa*, which it much resembles, but not so slender as in *Symphurus elongatus*, and the caudal fin not black. Upper eye slightly in advance of lower.

Sand color in life; light gray, everywhere finely mottled with light and dark, with traces of a few very narrow dark-cross bands. Fins all mottled; the caudal and posterior part of dorsal and anal not black, scarcely darker than anterior part.

Type numbered 2943, in the register of L. S. Jr. Univ. Mus.

Family ONCOCEPHALIDÆ.

232. **Oncocephalus elater** (Jordan & Gilbert).

One specimen, the type of the species, presented to Dr. Gilbert by Dr. Bastow, then a resident of Mazatlan. It is found in deep water, and was not seen by us, but numerous specimens have been since dredged by the Albatross in localities further to the south, so that the species is now well known.

SUPPLEMENTARY NOTE ON THE FISHES OF LA PAZ HARBOR.

Mr. James A. Richardson, a member of the Hopkins Expedition, spent two days at La Paz, the chief city of Baja California, where he made a small collection of fishes. The work was done under very unfavorable conditions, as La Paz has no fish market and its fish supply is obtained by the spear and the hook and line. There is but one seine at La Paz, a very old and rotten one, which was rented by Mr. Richardson, as was also a parachute seine and a small dip-net. Considering all the difficulties encountered, the list here given shows that the locality is well worthy of a detailed exploration.

Concerning the harbor of La Paz, Mr. Richardson has the following notes:

" The approach to La Paz estuary is guarded by several large islands, uninhabited, wild and precipitous. The entrance to the estuary is very wide, apparently ten or fifteen miles, the general direction being north and south and the length of the estuary about fifteen miles. The estuary gradually narrows to about one mile at ten miles from the entrance. As the steamer proceeds up the estuary it is noticed that she hugs the left bank closely. I was told that in all that breadth of water there is but a very narrow channel, the balance of the space in the estuary being of a sand formation, the sand bars coming very near the surface of the water so that they can be seen from the deck of the steamer. The steamer in following the channel nearly doubles on itself occasionally, and in the darkness of the night a boat is lowered and a search is made for certain buoys. The left bank is made up alternately of gravel beach and abrupt cliffs all the way to La Paz. The country behind La Paz is hilly and mountainous, of no value, covered with rocks and cactus. The right bank opposite La Paz, as far as one could see, is one vast stretch of sand and mangrove bushes lying a little above tide water. This is considered to be fine soil for cocoanut trees, but it is uninhabited and uncultivated. The sand beach is very fine; one could ride a bicycle here for fifty miles following the shore line."

1. **Narcine entemedor** Jordan & Starks.

Common. One specimen somewhat decayed found on the beach.

2. **Opisthonema libertate** (Günther).

Two specimens obtained (1¾ in. long).

3. **Stolephorus ischanus** Jordan & Gilbert.

Two small specimens.

4. **Stolephons curtus** Jordan & Gilbert.

One specimen.

5. **Mugil cephalus** Linnæus.

Very common.

6. **Mugil curema** Cuvier & Valenciennes.

Very common.

7. **Querimana harengus** (Günther).

Very abundant in the lagoons and small estuaries.

8. **Holocentrus suborbitalis** Gill.

Common in rock pools.

9. **Paralabrax maculatofasciatus** (Steindachner).

Common.

10. **Lutianus novemfasciatus** Gill.

Two specimens.

11. **Lutianus argentiventris** (Peters).

One specimen obtained.

12. **Xenistius californiensis** (Steindachner).

Several young specimens obtained.

Silvery, with continuous streaks of bright warm brown along the rows of scales.

13. **Pomadasis macracanthus** (Günther).

Common.

14. **Orthopristis reddingi** Jordan & Richardson, n. sp. Plate xli.

Allied to *Orthopristis ruber* (Cuv. & Val.)

Head 3⅙; depth 3; dorsal XII, 15; anal III, 10; scales 8–52–15; 53 pores.

Eye 4¼ in head; maxillary 3¼; preorbital 4¼ in snout; pectoral 1⅖ in head; longest dorsal spine 2⅚; longest soft ray 3⅗; second anal spine 4⅔; ventral 1⅔; upper caudal lobe 1½; base of soft dorsal in spinous 1¾.

Body oblong, the back not much elevated; the anterior profile straightish, slightly depressed above the eye; mouth small, low, the maxillary reaching to opposite the nostril; teeth subequal, in broad bands; lower jaw included; nostrils both oblong, the anterior the larger; eye rather large, about as wide as the broad preorbital; preopercle very finely serrated on its posterior margin only, the serrations very weak; gill-rakers short and small, about 12; scales moderate, the rows above lateral line very oblique, those below nearly horizontal, the series from the scapular scale reaching middle of spinous dorsal. Spinous dorsal moderate, not deeply notched, the median spines injured in youth in the type specimen; soft dorsal low, free from scales; anal spines low, the second a little longer than third; soft rays scaleless; caudal lunate, the lobes unequal, the upper longer than lower, which is more obtuse. Ventrals rather long, inserted just behind axil of pectoral. Pectoral rather short, not quite reaching tips of ventrals.

Color pearly gray, darker above; each scale of back and sides, with a bright bronze spot behind its center; these forming nearly continuous streaks along the rows of scales. These streaks run upward and backward anteriorly and nearly horizontally on sides, when they are more or less interrupted or transposed. Head plain gray, dorsal with some streaks and clouds; outer fins plain; ventrals somewhat dusky.

One specimen, 8¾ inches long, was taken by Mr. Richardson.

This species is very closely allied to the Atlantic species, *Orthopristis ruber* (Cuv. & Val.), but has the body a little more slender and the head larger.

The specimen from Guaymas provisionally referred to *Orthopristis cantharinus* (see Jordan & Fesler. Rept. U. S. Fish Com. for 1889 to 1891, 500, 1893), is perhaps a second specimen of *Orthopristis reddingi*.

This species is named in honor of Hon. Benjamin B. Redding, first Fish Commissioner of California, a man deeply interested in scientific research, to whom Mr. Richardson has been indebted for many favors, in his former capacity of Superintendent of the California Fish Hatching Station at Sisson.

15. **Microlepidotus inornatus** Gill.

One specimen, 10 inches long, obtained. Common.

16. **Umbrina xanti** Gill.

Common.

17. **Micropogon ectenes** Jordan & Gilbert.

One specimen.

18. **Eucinostomus gracilis** (Gill).

Common.

19. **Xystæma cinereum** (Walbaum.)

Common. About twenty specimens obtained.

20. **Gerres lineatus** (Humboldt).

Common.

21. **Scarus perrico** Jordan & Gilbert.

One specimen, found dead on the beach.

22. **Spheroides lobatus** (Steindachner).

Common. Two specimens obtained. In color these approach *Spheroides augusticeps* (Jenyns). It may be that *lobatus* is, after all, the young of *augusticeps*, as was supposed by Jordan and Gilbert.

23. **Diodon holacanthus** Linnæus.

Common. One specimen, 11 inches long, was obtained. D. 12; A. 12; back and sides covered with spots; no spots on fins or tail; back very dark; a dark band between eyes; frontal spines nearly as long as pectoral spines which are longest.

24. **Alexurus armiger** Jordan, n. g. and sp. GOBIIDÆ. Plate xlviii.

Head 4⅔; depth 8; dorsal VI–13; anal 11; V. I, 5; scales about 102–30; eye 8 in head; maxillary 2⅔; mandible 2½; snout 5⅔; interorbital 4⅓; pectoral 1⅘; caudal equals head; ventral 2; last dorsal ray 1⅗.

Body long and low, compressed posteriorly, depressed in front. Head flattish and broad above, the cheeks moderately tumid. Eyes small, high up, separated by a broad flattish interorbital space; snout short; mouth moderate, very oblique, the maxillary ceasing below the center of pupil; lower jaw very heavy, oblique, projecting beyond upper, its outline horseshoe-shaped, obtuse in front. Teeth in rather broad bands, the outer enlarged below, but scarcely so above; none of them canine-like. Top of head with very small scales. Cheeks and opercles with rudimentary scales above. Preopercle with a concealed antrose hook below as in *Eleotris*. Scales on body very small, perfectly smooth, partially imbedded; scales on nape and throat minute. Gill membranes extending a little forward below, so that the branchiostegals are free from the isthmus.

Insertion of dorsal twice as far from middle of base of caudal as from tip of snout; the fin low, its slender rays slightly filamentous. Soft dorsal low, its last ray highest. Anal similar, beginning under second dorsal ray. Caudal long, bluntly pointed behind, with strongly procurrent base above and below, the base above two-fifth length of head formed of fourteen short rays, that below a little shorter, of twelve rays, this procurrent portion forming an angle with the caudal proper where it joins it. Pectoral and ventrals short, the ventrals inserted under pectorals.

Color olive green, dusky above, paler below, but everywhere covered with fine black dots. Both dorsals with the membranes pale, the rays each barred with black. Caudal mesially blackish, all the rays barred or chequered in fine pattern. Pectoral and anal pale, similarly speckled; base of pectoral dusky; ventral finely speckled.

One specimen, 6½ inches long, taken by Mr. James A. Richardson in the harbor of La Paz.

This species seems to be the type of a distinct genus allied to *Eleotris* and *Erotelis*, distinguished from *Eleotris* by its very small cycloid scales, from *Erotelis* by its concealed preopercular hook, and from both by the procurrent caudal fin. The generic name is from *ἀλέξω*, to protect; *οὐρά*, tail.

25. **Gobius sagittula** (Günther).

Two large specimens, each six to eight inches long, besides one very young example, corresponding to the form called *Gobius longicauda* of Jenkins & Evermann. As Dr. Gilbert has noticed, this is the adult form of the species called by Dr. Günther *Euctenogobius sagittula*, of which specimens were found by us at Mazatlan.

The species is very similar to *Gobius oceanicus* of the Atlantic.

26. **Gobius soporator** Cuvier & Valenciennes.

Very common.

27. **Scorpæna mystes** Jordan & Starks.

Common.

28. **Labrosomus xanti** Gill.

Common in rock pools.

29. **Labrosomus delalandi** (Cuvier & Valenciennes).

Common in rock pools.

30. **Auchenopterus monophthalmus** Günther.

Not rare; in rock pools.

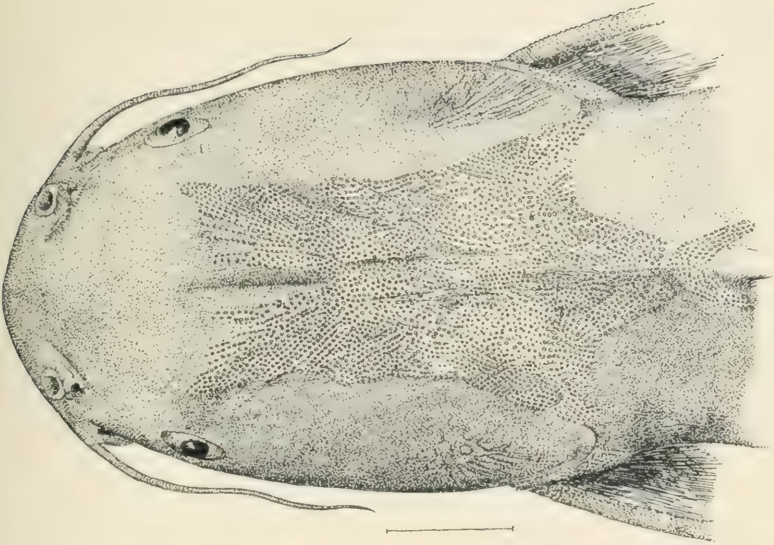
31. **Paralichthys adspersus** (Steindachner).

Very common; about ten specimens taken.

LIST OF PLATES.

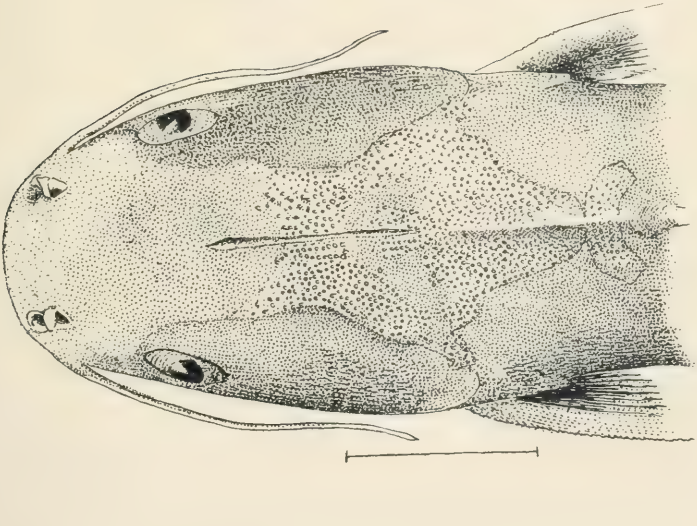
XXVI. Galeichthys gilberti.
XXVII. Galeichthys azureus.
XXVIII. Sardinella stolifera.
XXIX. Pœcilia presidionis.
XXX. Siphostoma starksii.
XXXI. Mugil hospes.
XXXII. Eurystole eriarcha.
XXXIII. Thyrina evermanni.
XXXIV. Caranx medusicola.
XXXV. Hynnis hopkinsi.
XXXVI. Trachinotus culveri.
XXXVII. Apogon retrosella.
XXXVIII. Mycteroperca boulengeri.
XXXIX. Rabirubia inermis.
XL. Lythrulon opalescens.
XLI. Orthopristis reddingi.
XLII. Eupomacentrus flavilatus.
XLIII. Microspathodon bairdii.
XLIV. Microspathodon azurissimus
XLV. Halichœres dispilus.
XLVI. Xesurus punctatus.
XLVII. Teuthis crestonis.
XLVIII. Alexurus armiger.
XLIX. Garmannia paradoxa.
L. Aboma etheostoma.
LI. Evermannia zosterura.
LII. Scorpæna mystes.
LIII. Enneanectes carminalis.
LIV. Dinematichthys ventralis.
LV. Symphurus williamsi.

PLATE XXI



GALEICHTHYS AZUREUS.

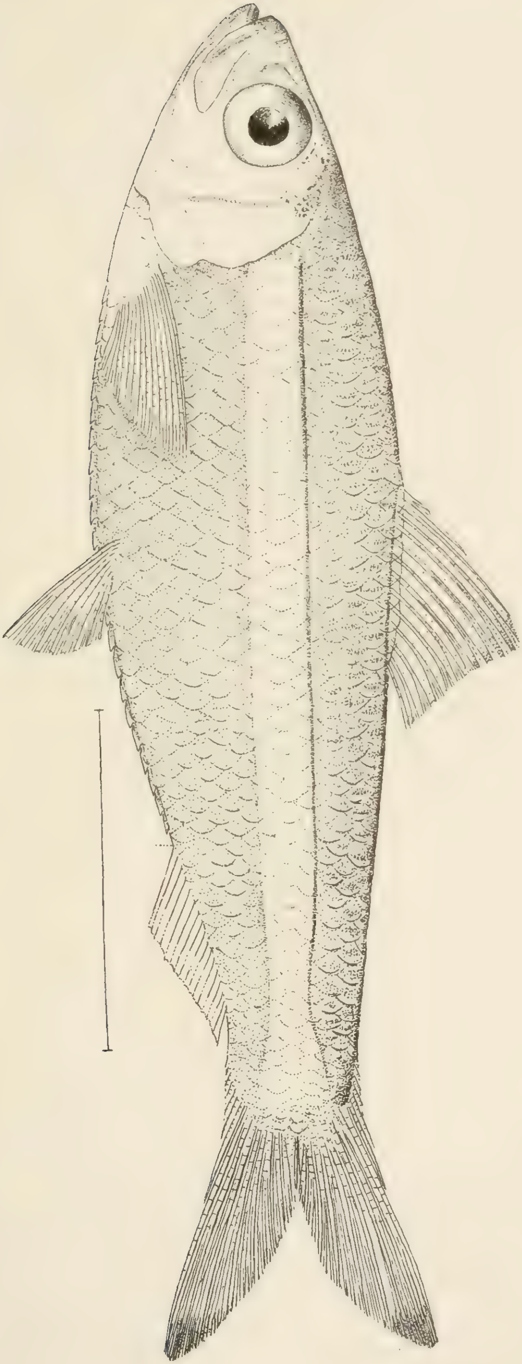
PLATE



GALEICHTHYS GILBERTI.

ANNA L. BROWN, DEL.

LITH BRITT N Y

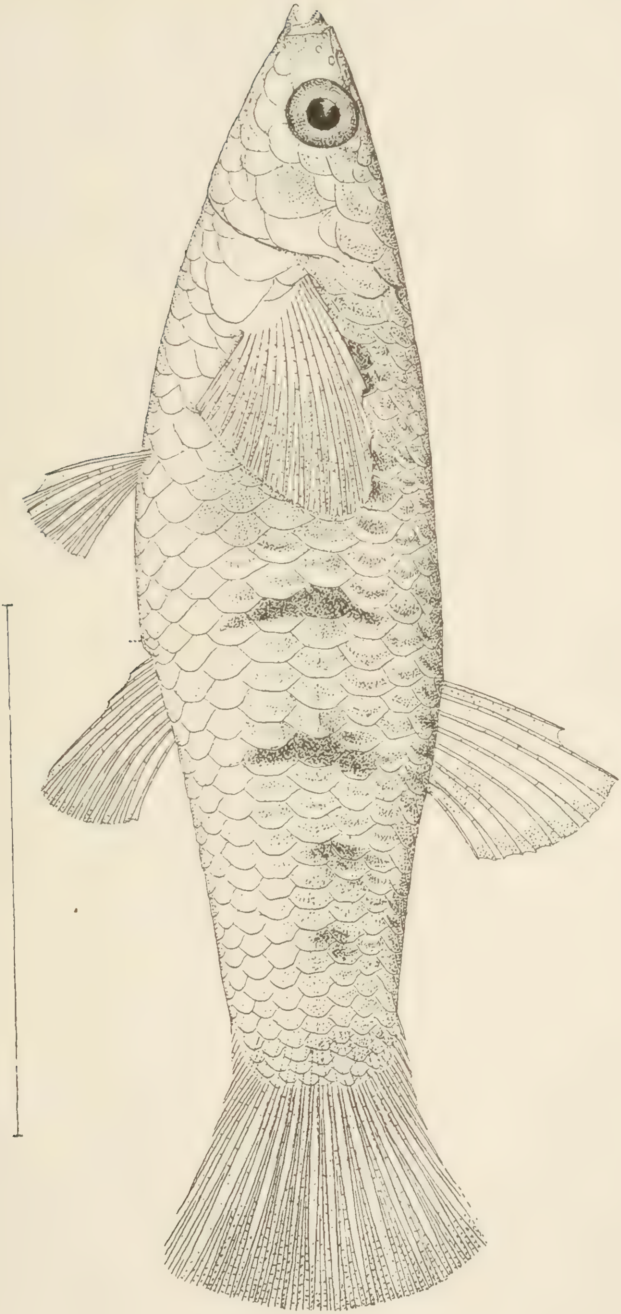


SARDINELLA STOLIFERA.

A. Brown, Del.

Lith. Britton & Rey

PLATE XXIX.



PŒCILIA PRESIDIONIS.

ANNA L. BROWN DEL.

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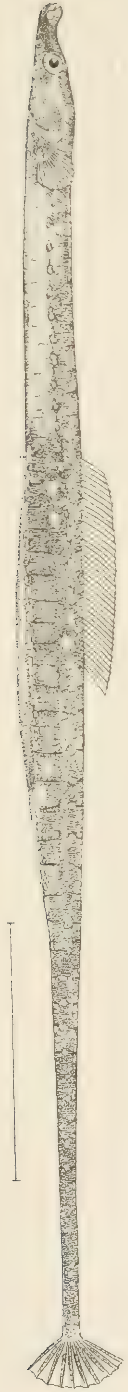
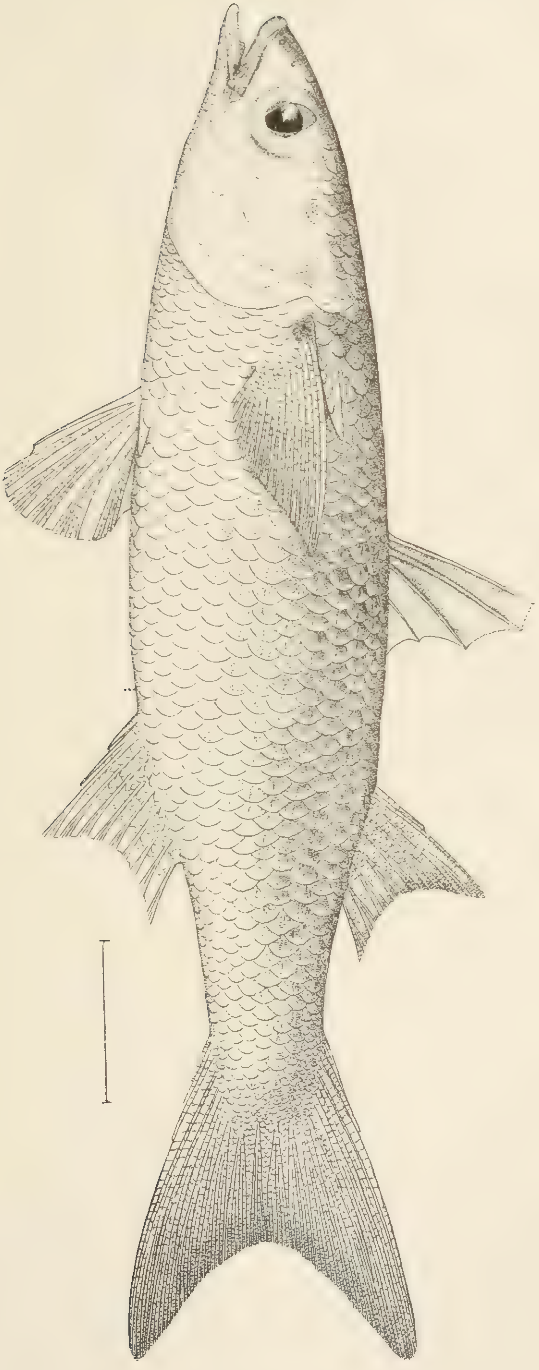


SIPHOSTOMA STARKSII.

ANNA L. BROWN, DEL.

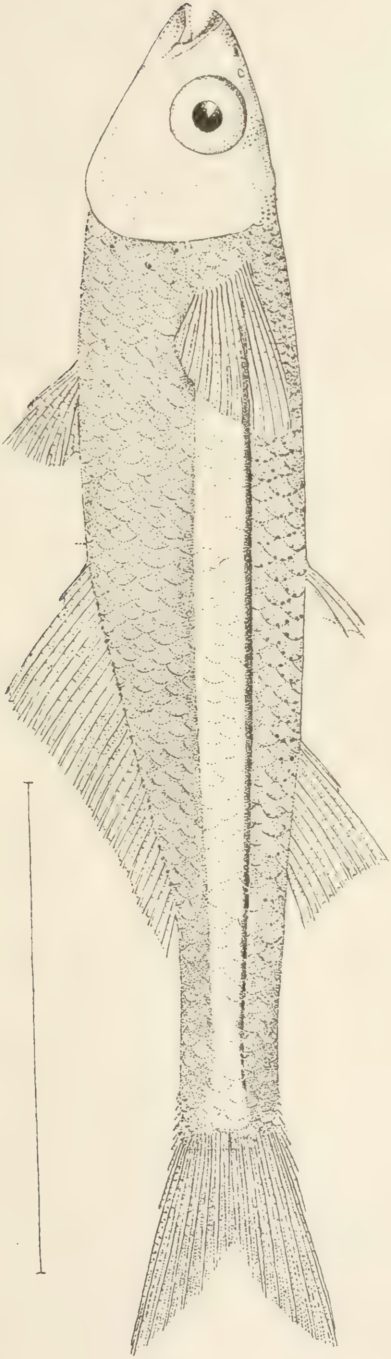
[illegible]



MUGIL HOSPES.

ANNA L. BROWN DEL.

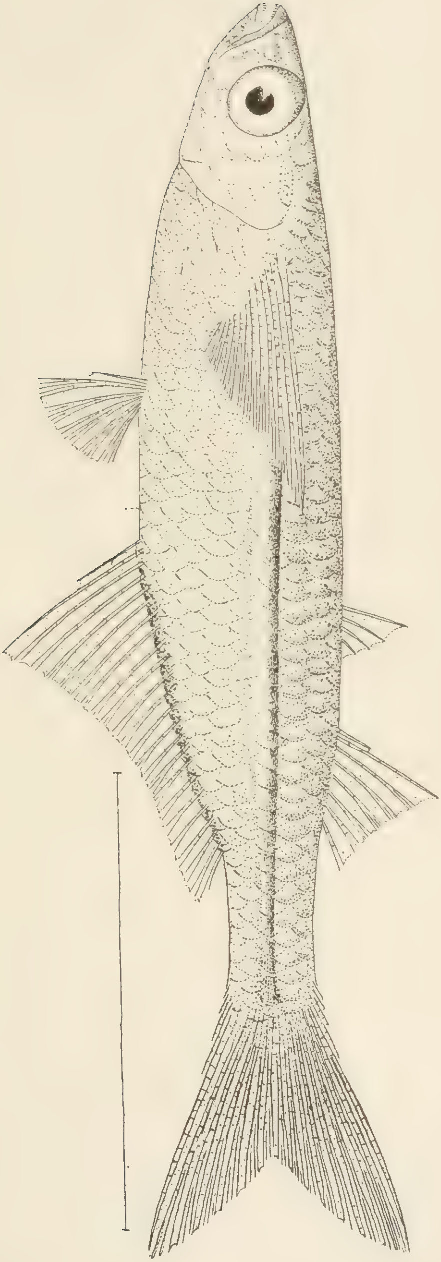
[illegible]



EURYSTOLE ERIARCHA.

Anna L. Brown, Del.

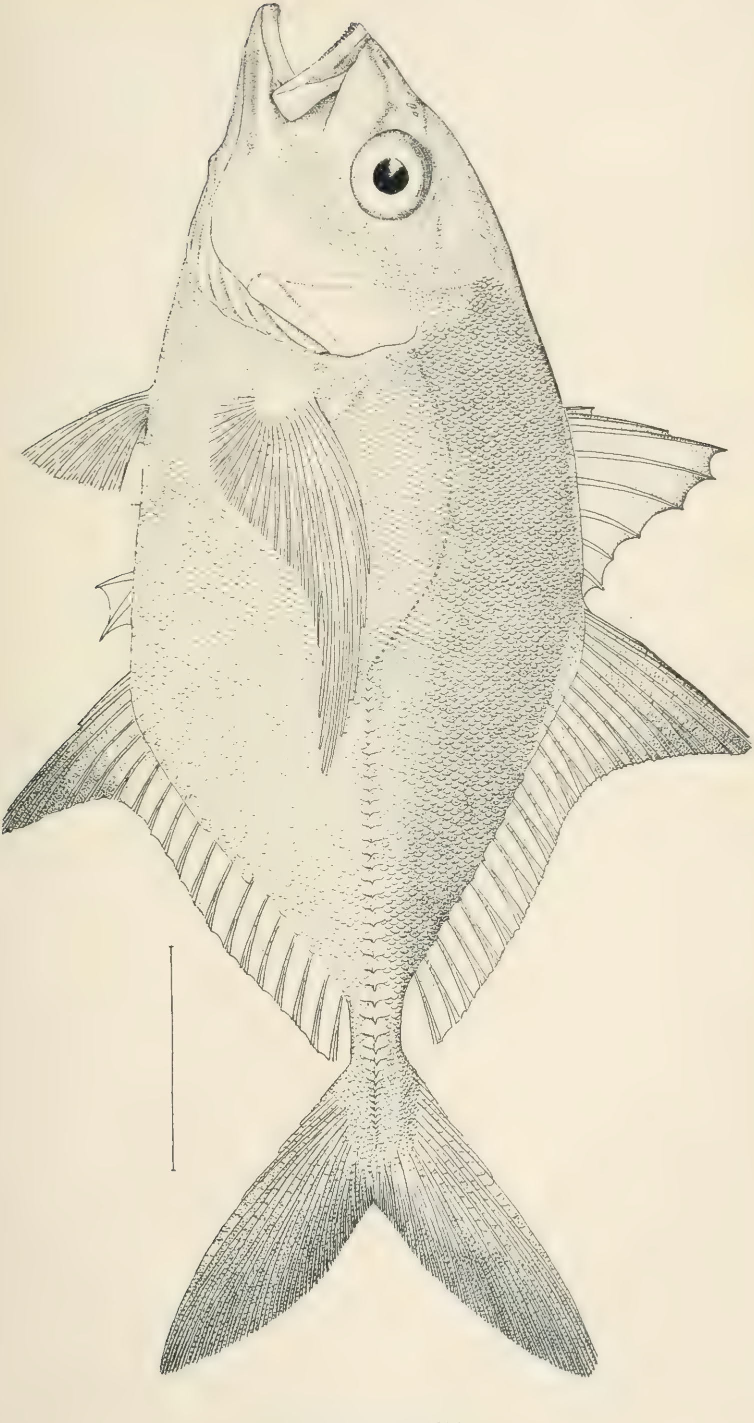
[illegible]



THYRINA EVERMANNI.

nna L. Brown Del. [illegible]

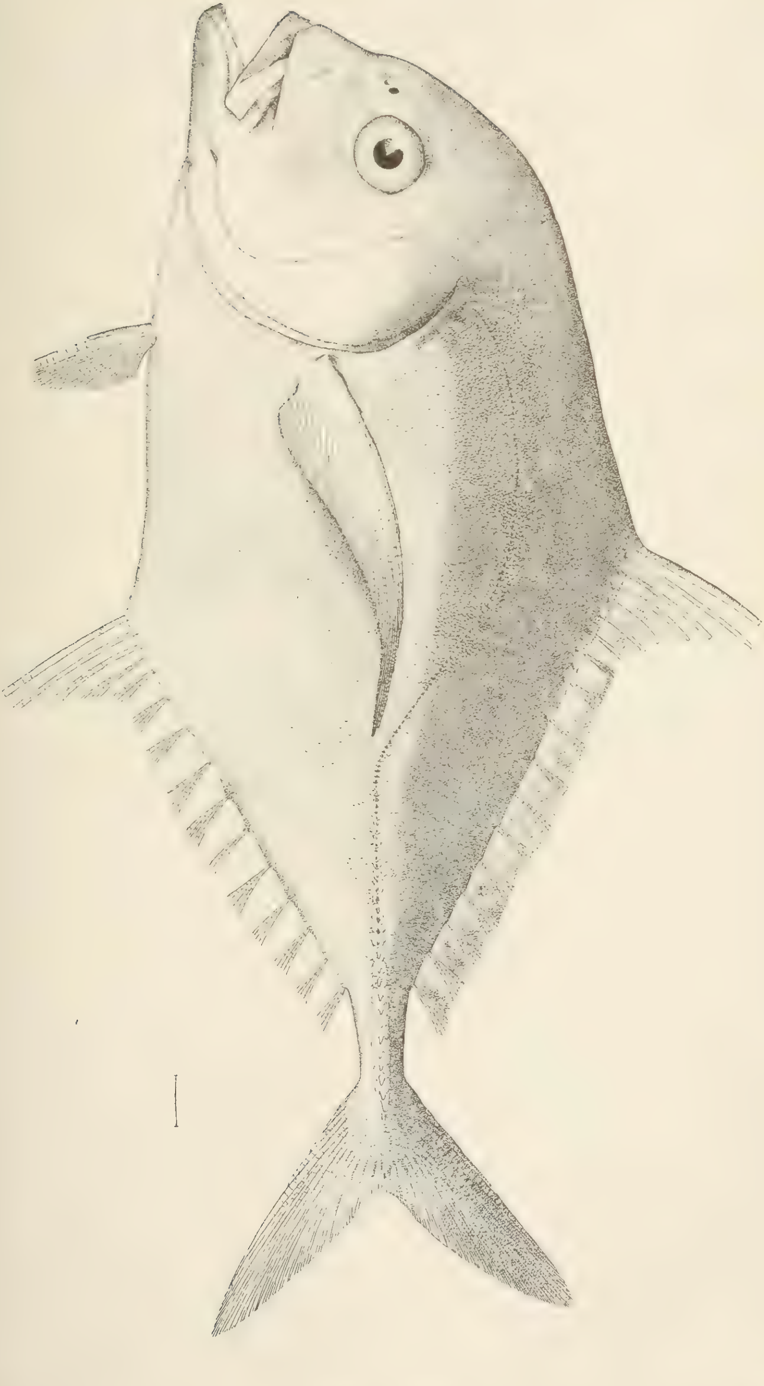
PLATE XXXIV



CARANX MEDUSICOLA.

..Brown, Del. [illegible]

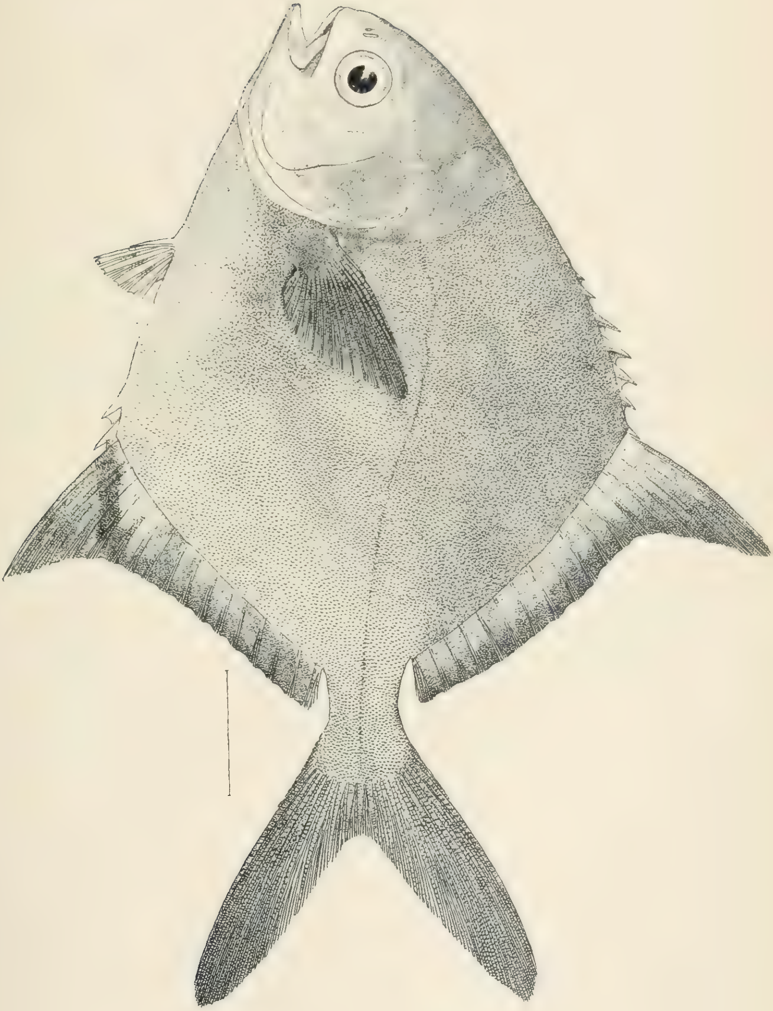
PLATE [illegible]



HYNNIS HOPKINSI.

[illegible] [illegible]

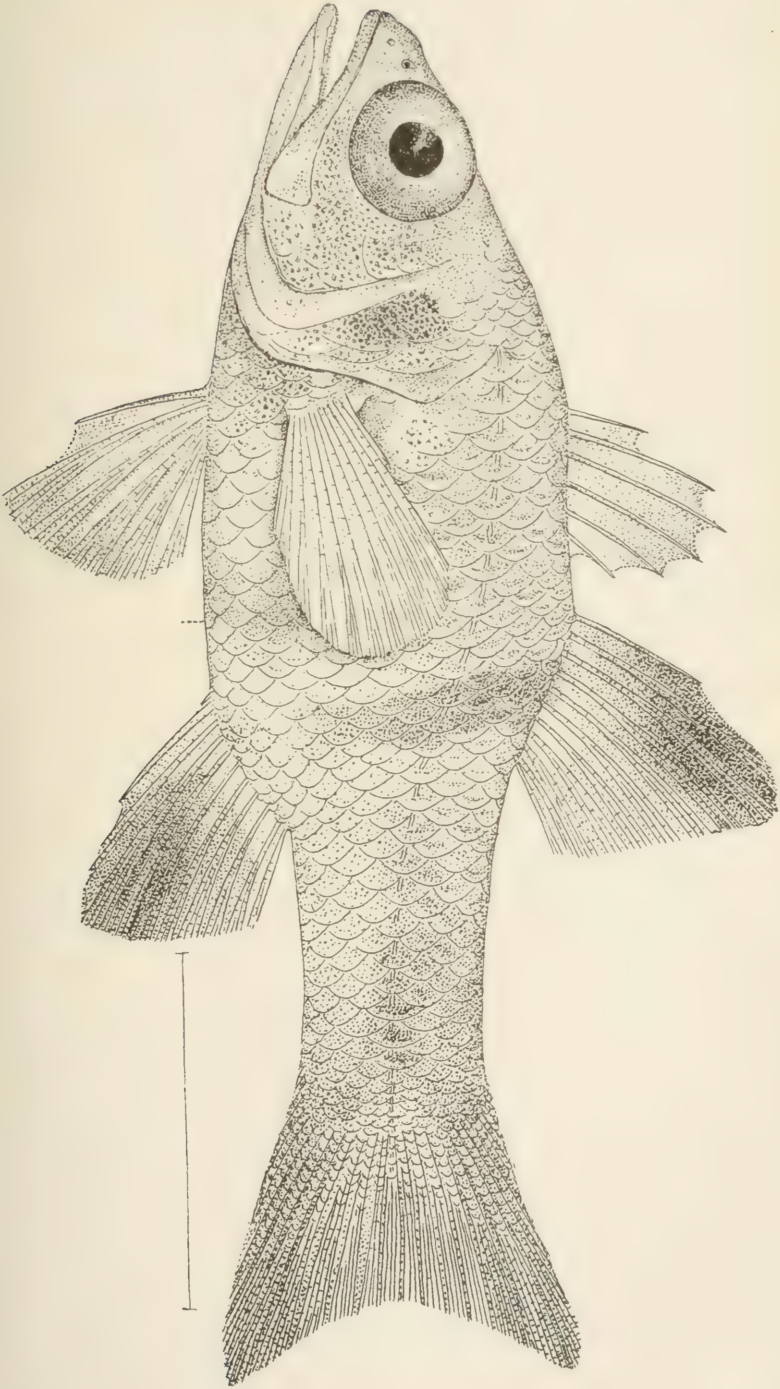
PLATE XXXVI.



TRACHINOTUS CULVERI.

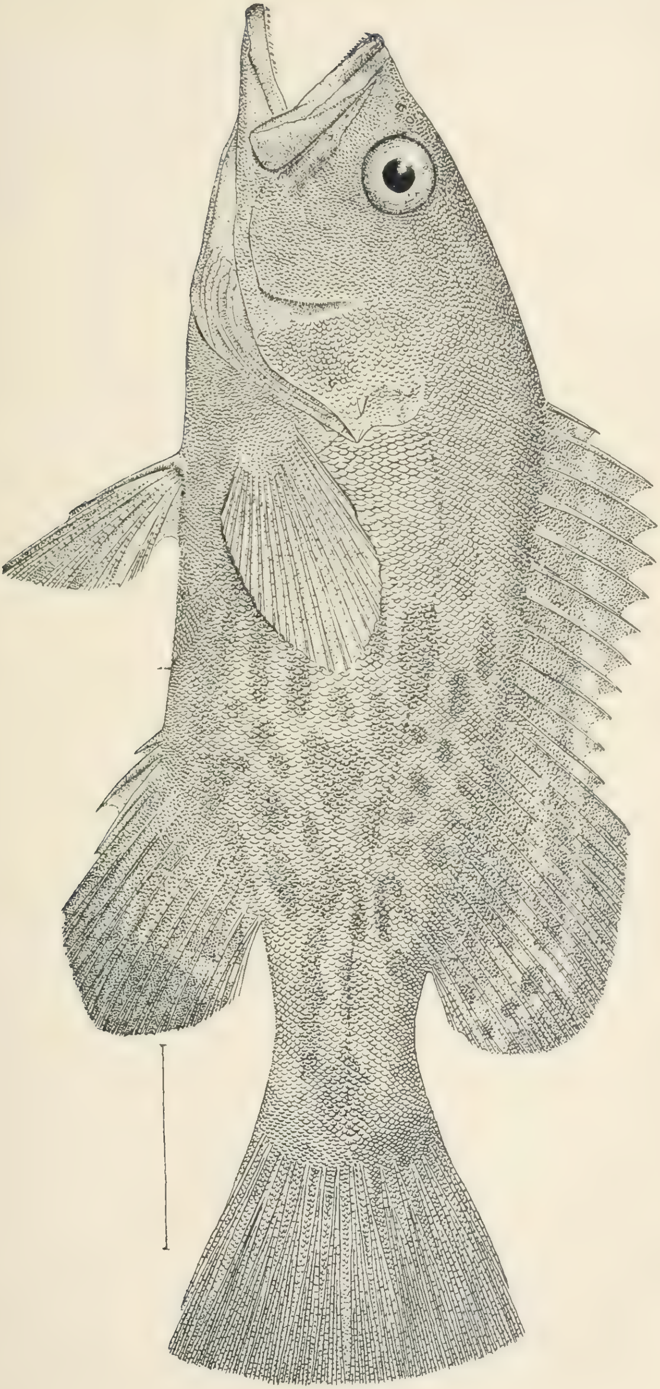
na L. Brown. Del.

Lith. Britt N & Rey.



APOGON RETROSELLA.

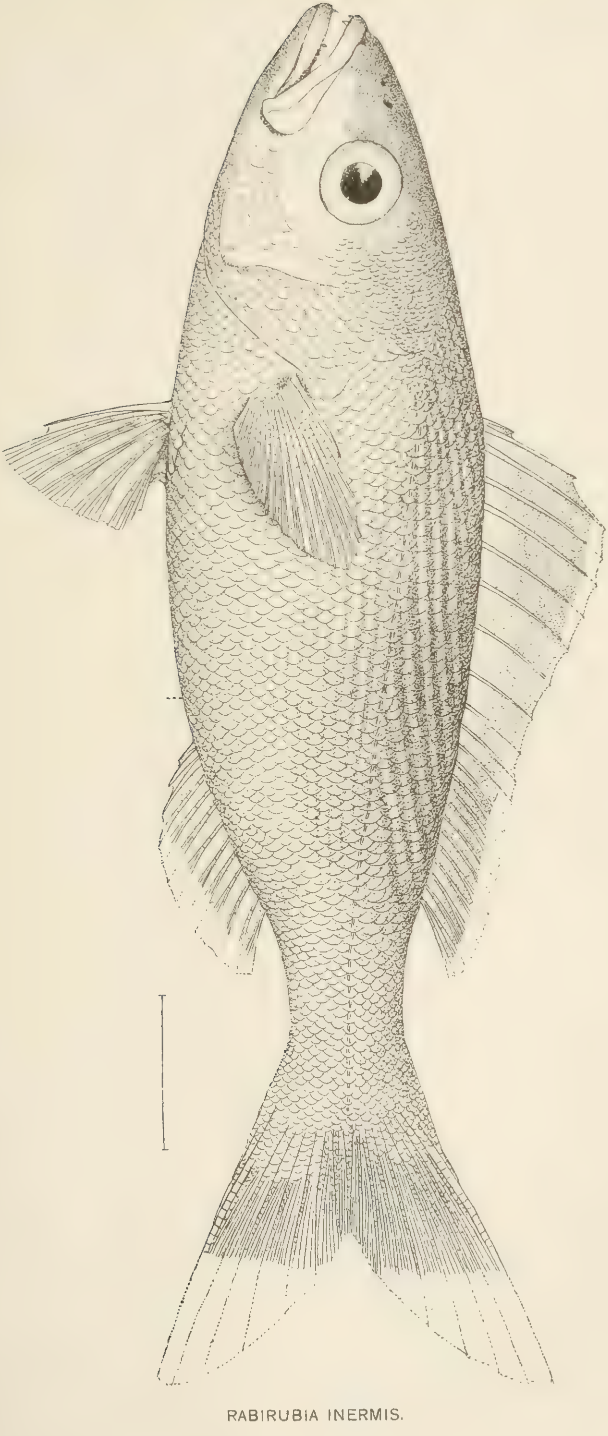
Brown, del. [illegible]



MYCTEROPERCA BOULENGERI.

A L Brown del.

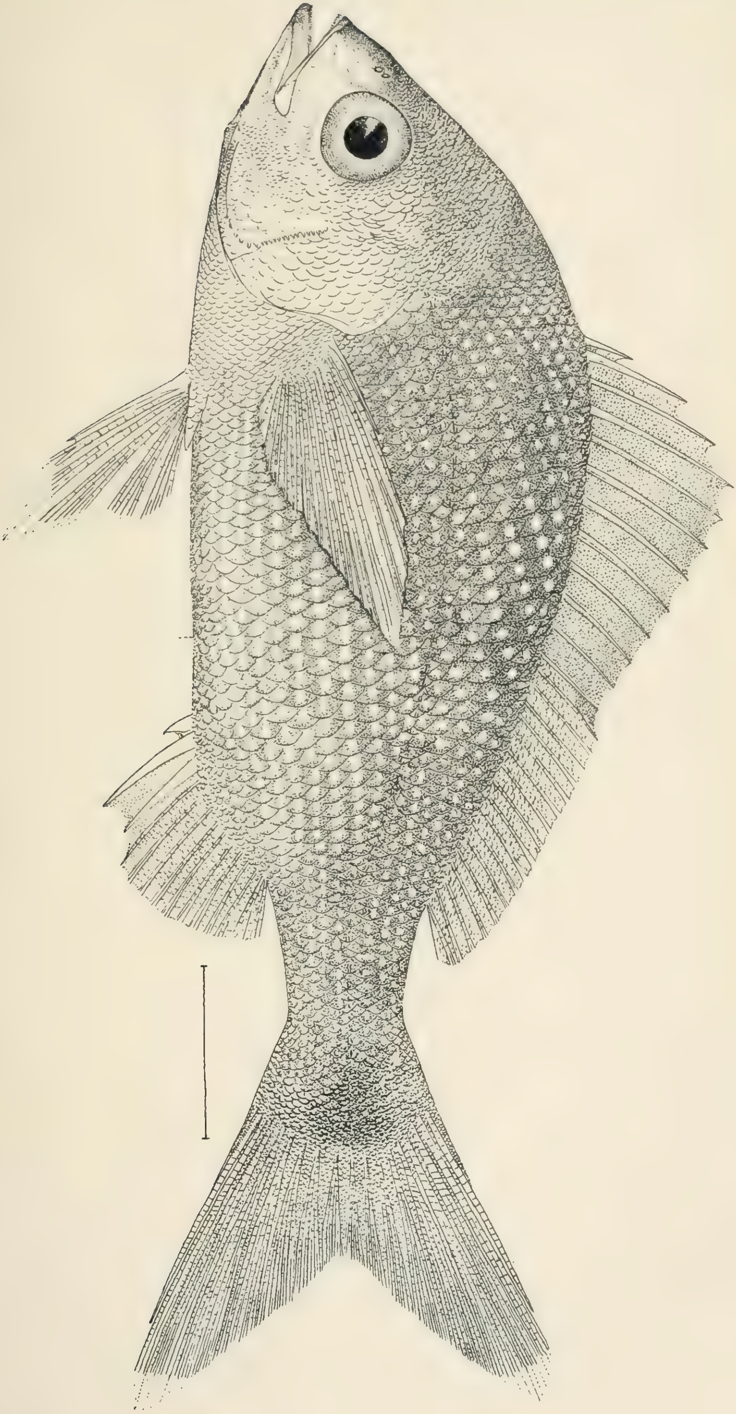
[illegible]



RABIRUBIA INERMIS.

Brown del.

Lith. Britton & Rey S.F.

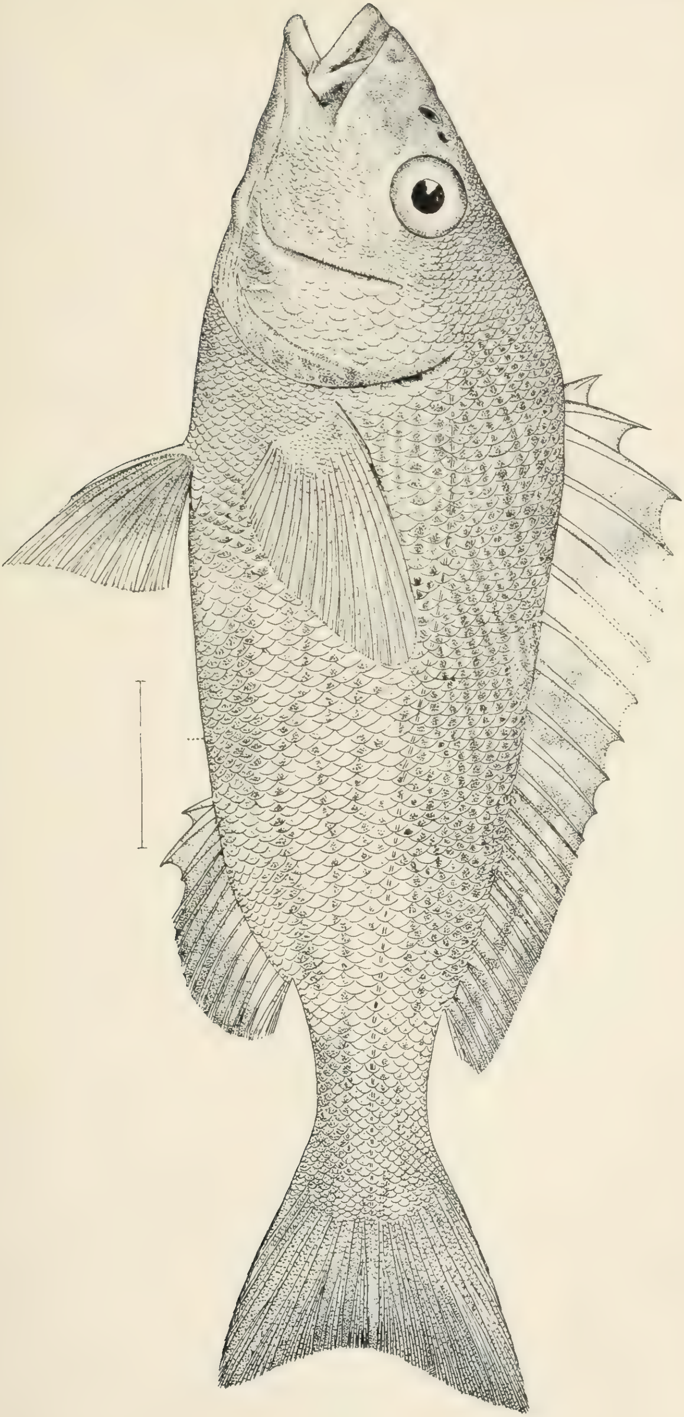


LYTHRULON OPALESCENS.

L. BROWN, DEL.

LITH BRITTON & REY, S.F.

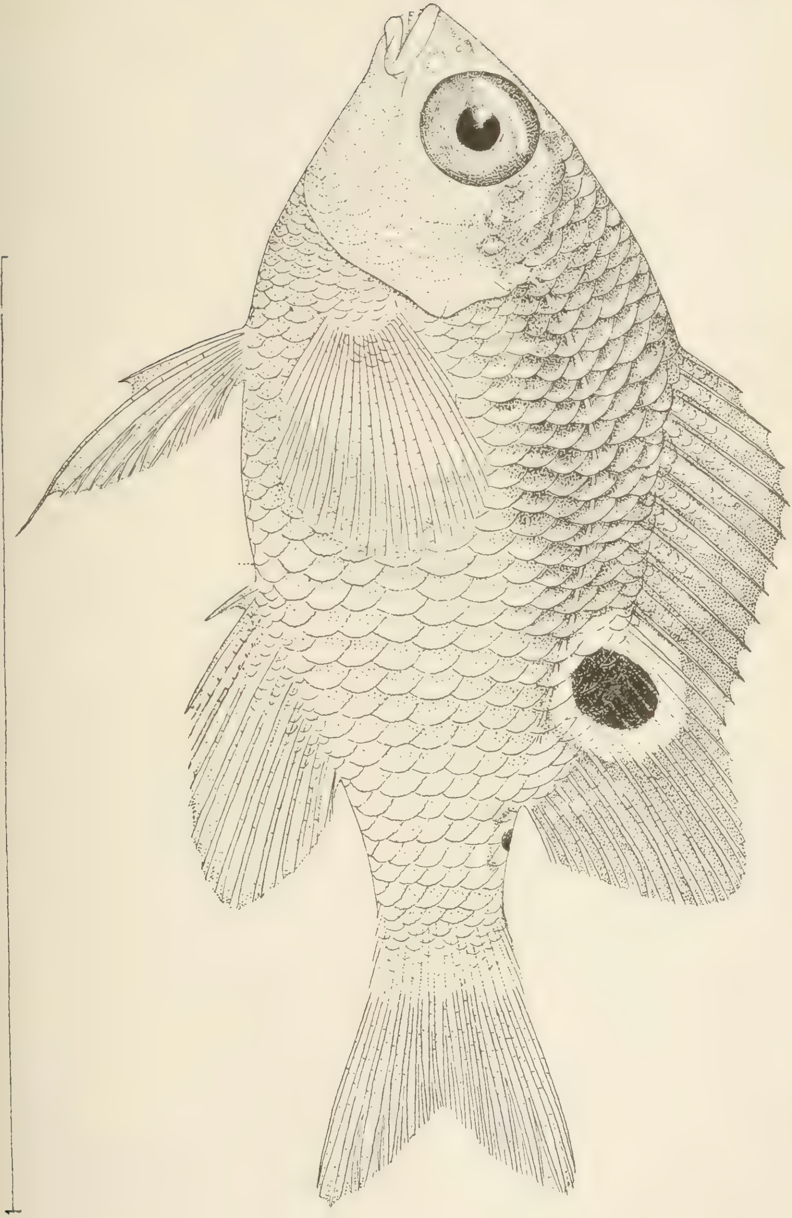
PLATE XLI.



ORTHOPRISTIS REDDINGI.

L. Brown, Del.

Lith Britton & Rey S.F.



EUPOMACENTRUS FLAVILATUS.

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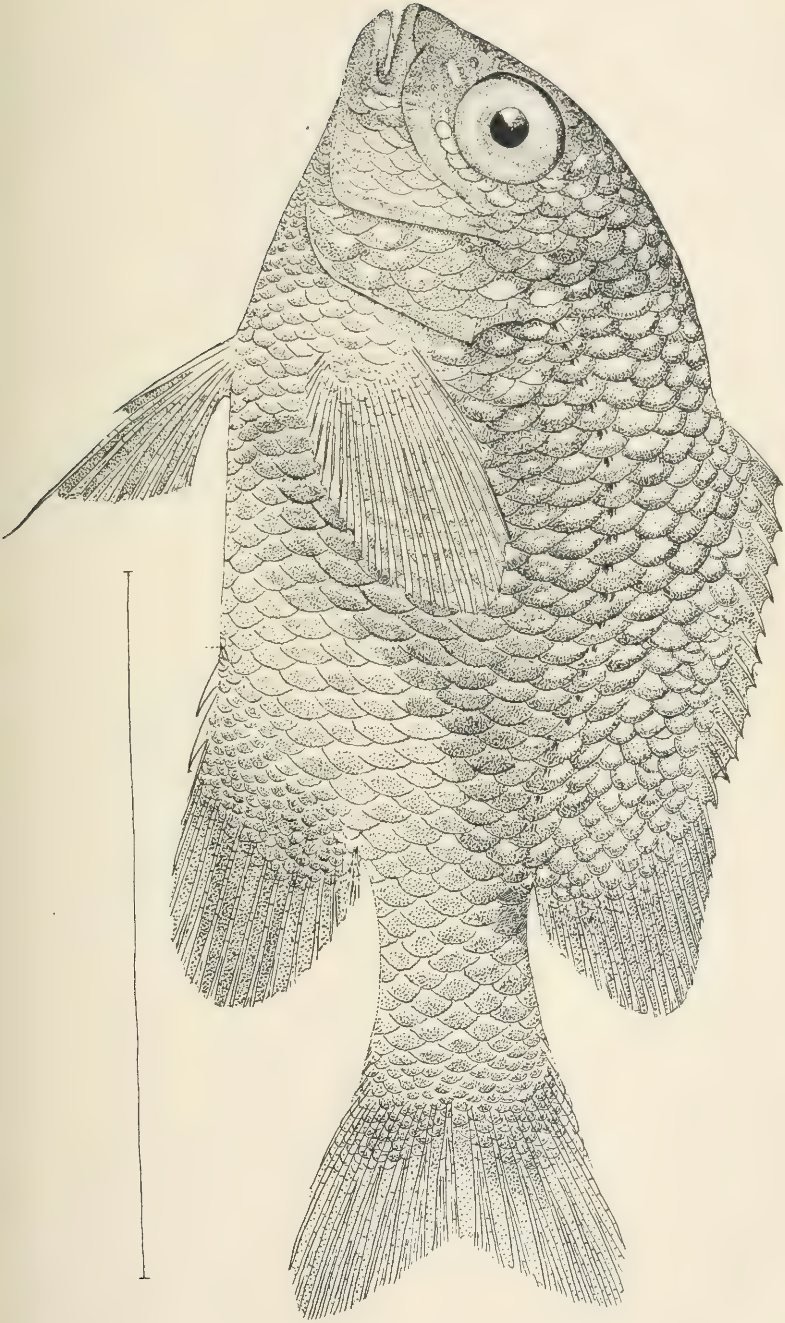
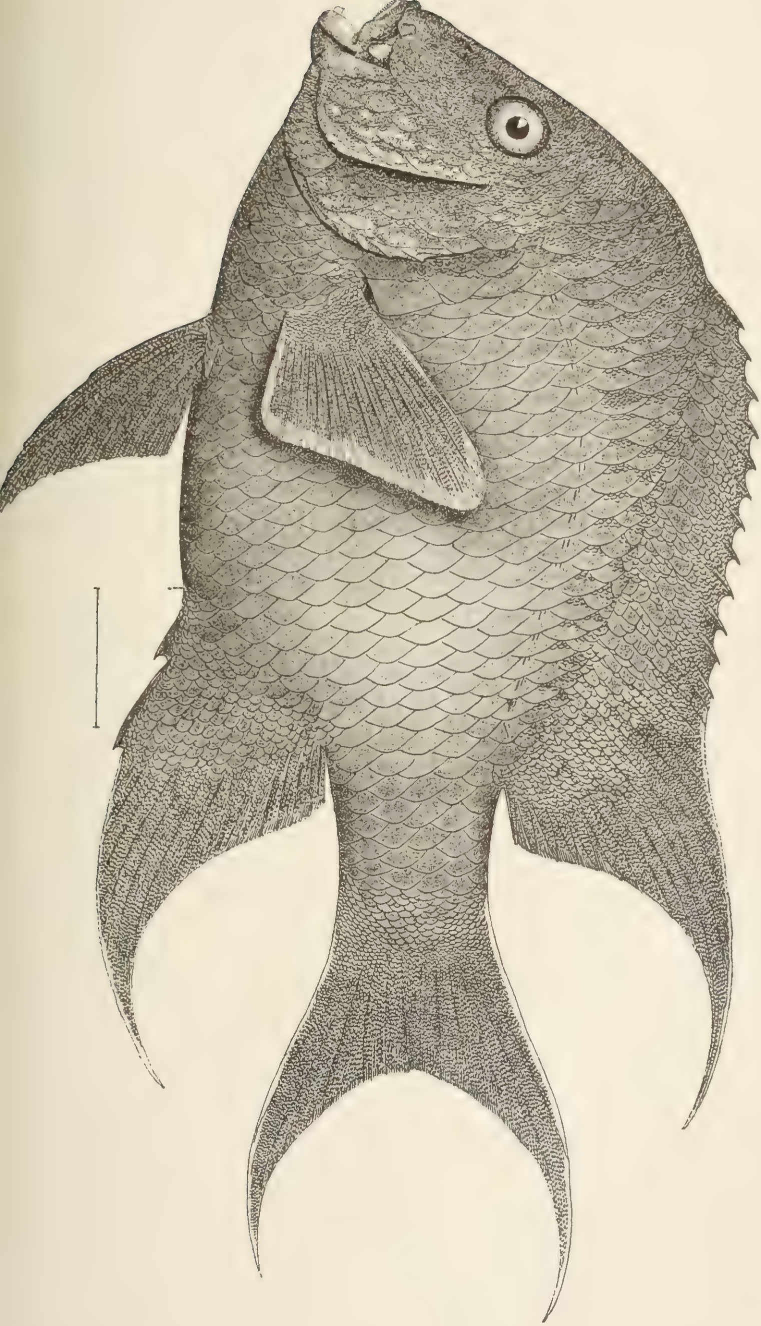


MICROSPATHODON BAIRDII.

L.BROWN, DEL

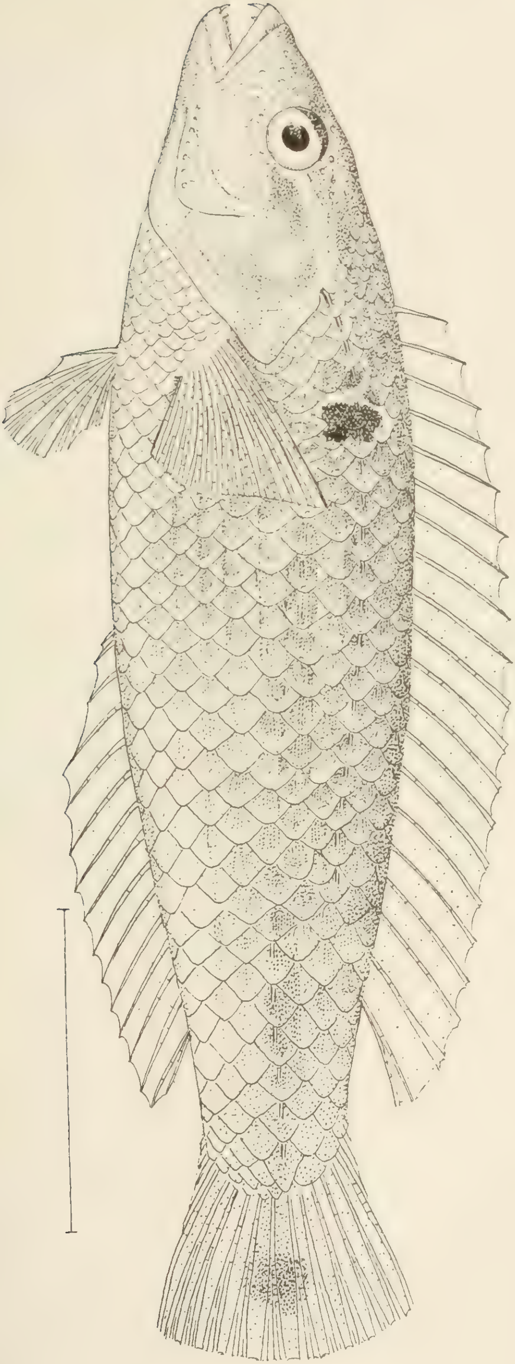


MICROSPATHODON AZURISSIMUS.

n. Del.

LITH BRITTON & REY, S.F.

PLATE XLV.



HALICHŒRES DISPILUS.

na L. Brown del.

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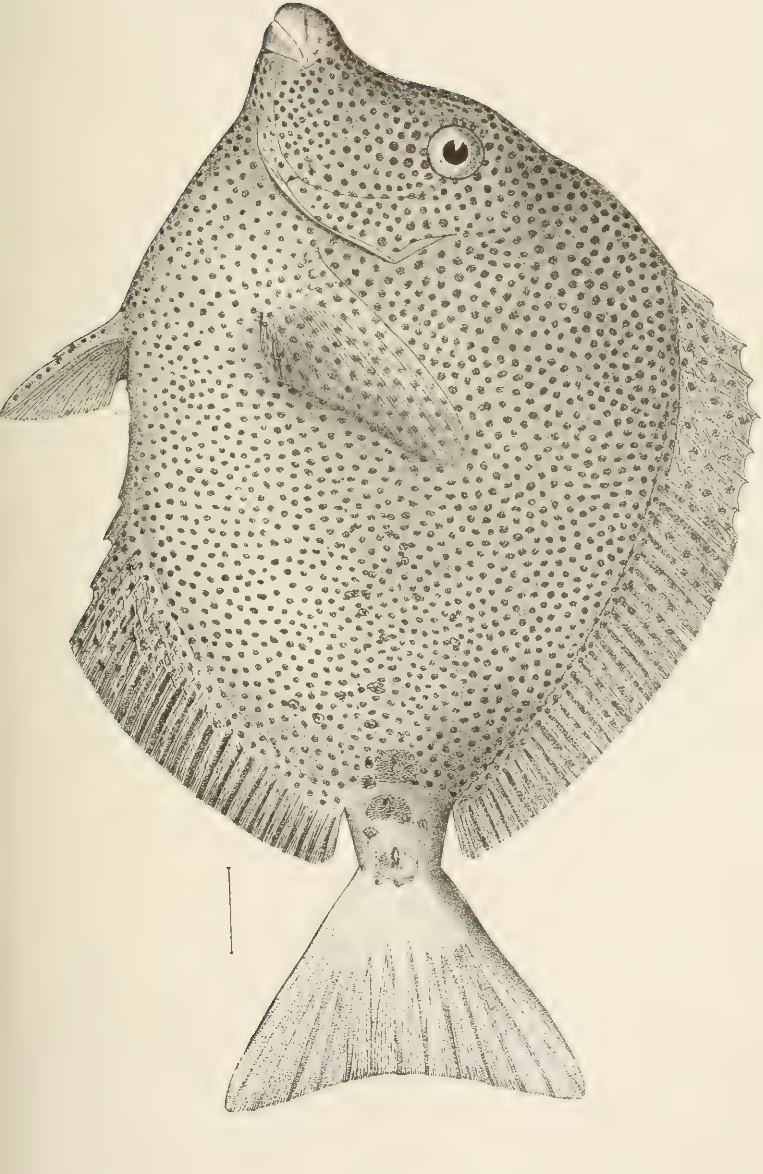
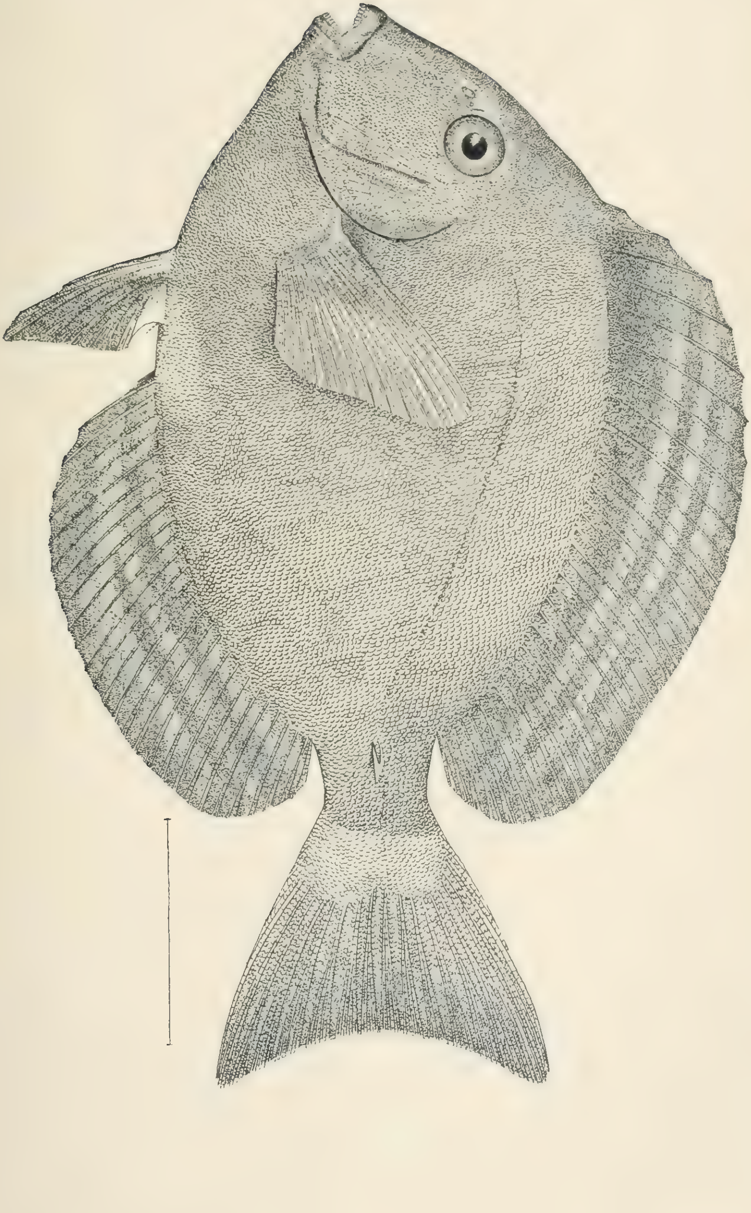


XESURUS PUNCTATUS.

BROWN, DEL.

[illegible]

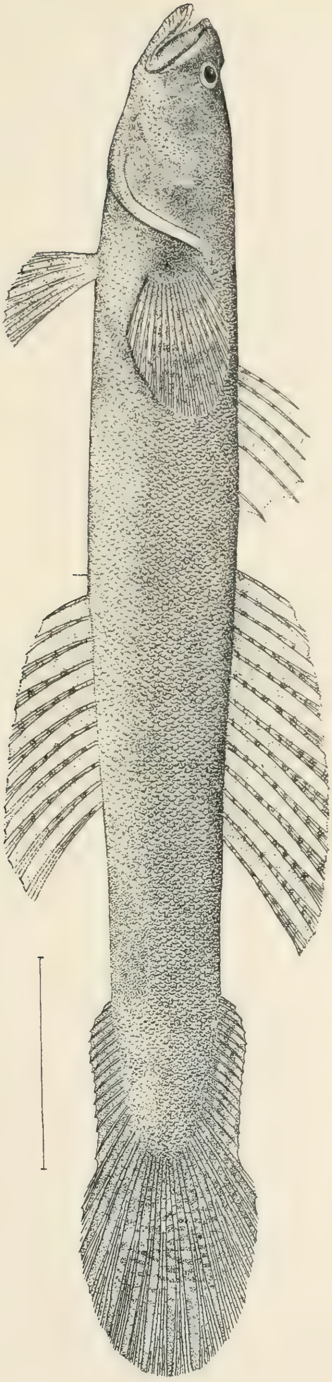
PLATE XVII.



TEUTHIS CRESTONIS.

L. BROWN, DEL. [illegible]

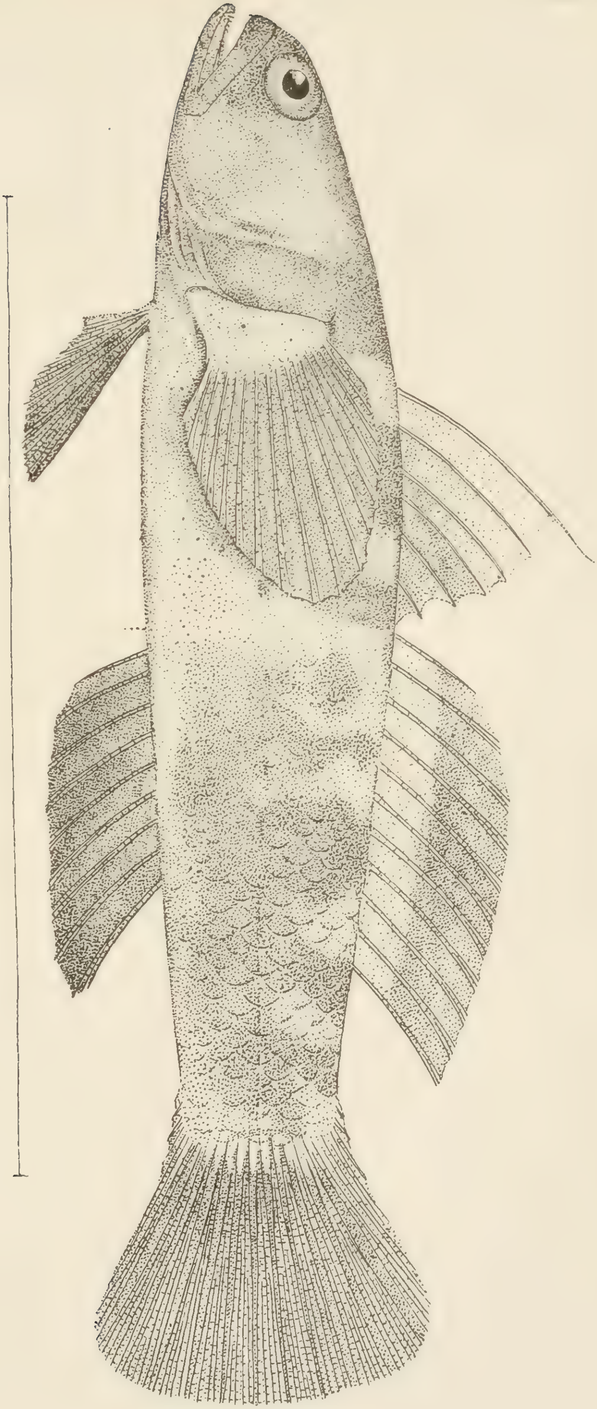
PLATE XLVIII



ALEXURUS ARMIGER.

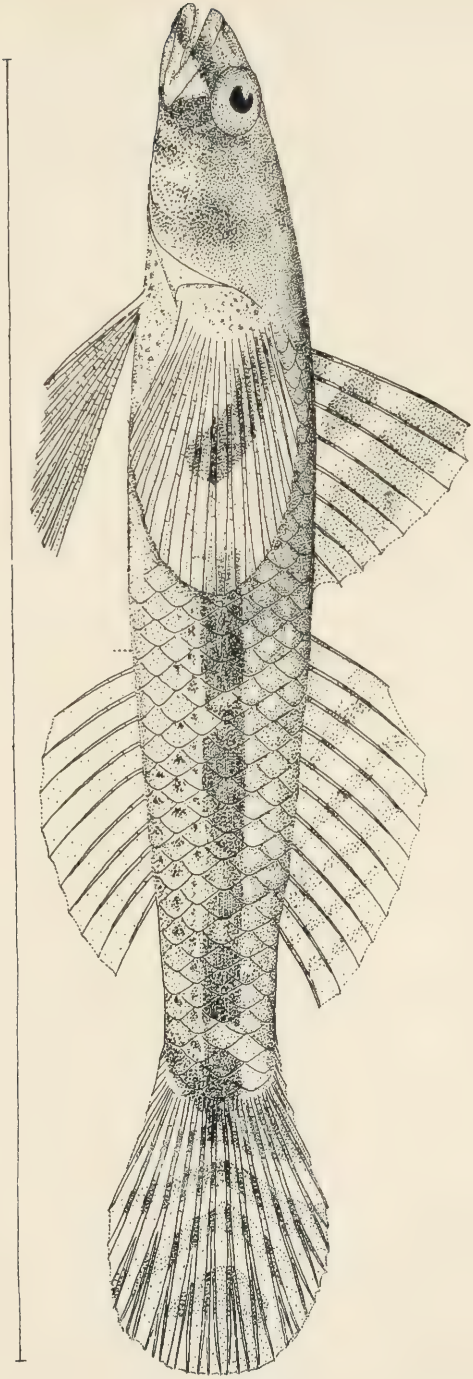
a L. Brown, Del.

Lith Britton & Rey S.F.



GARMANNIA PARADOXA.

Anna L. Brown del. Lith. Britton & R

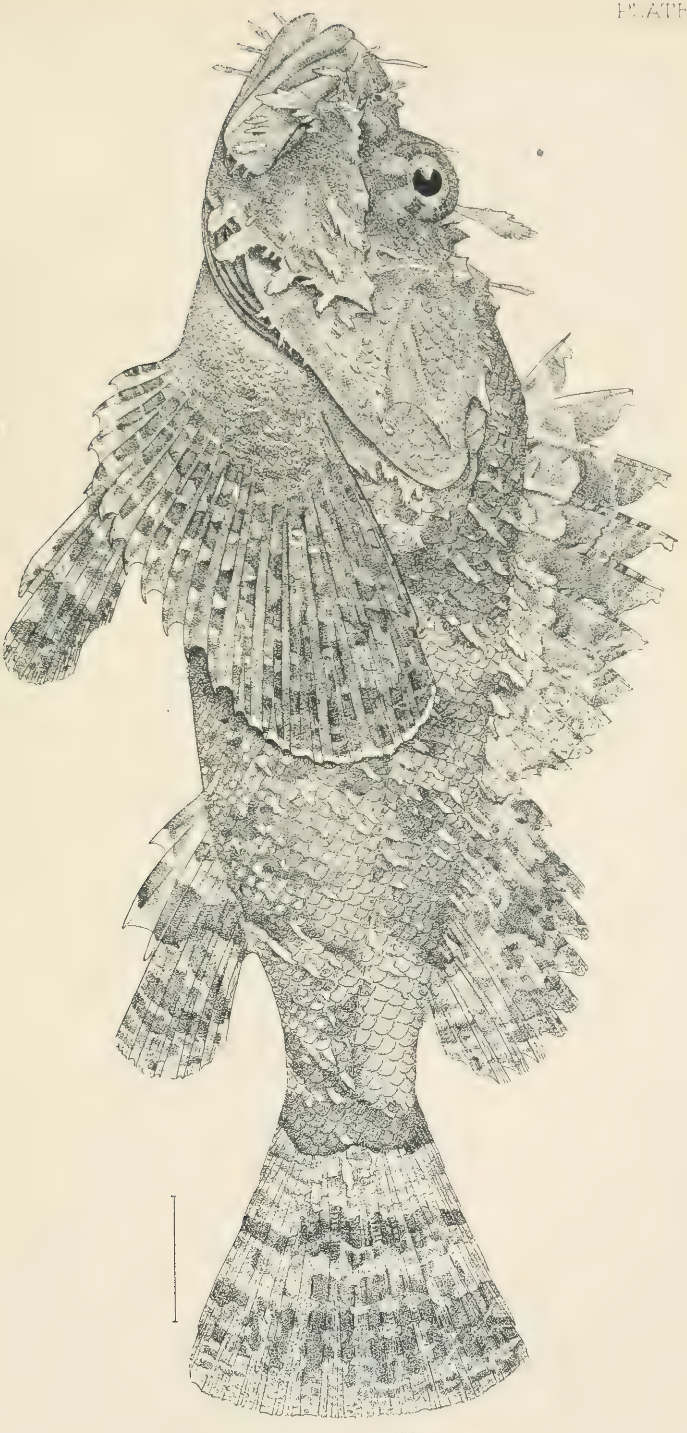


ABOMA ETHEOSTOMA.

ANNA L. BROWN, DEL.

LITH. BRITTO

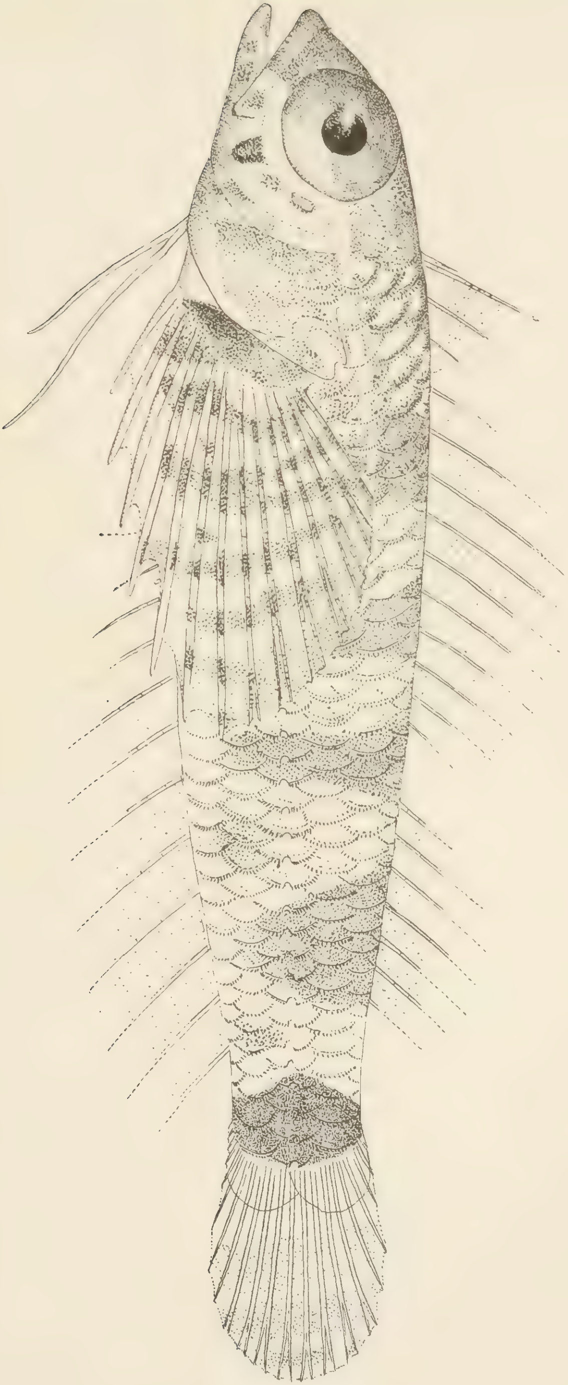
PLATE LII



SCORPÆNA MYSTES.

ANNA L. BROWN DEL.

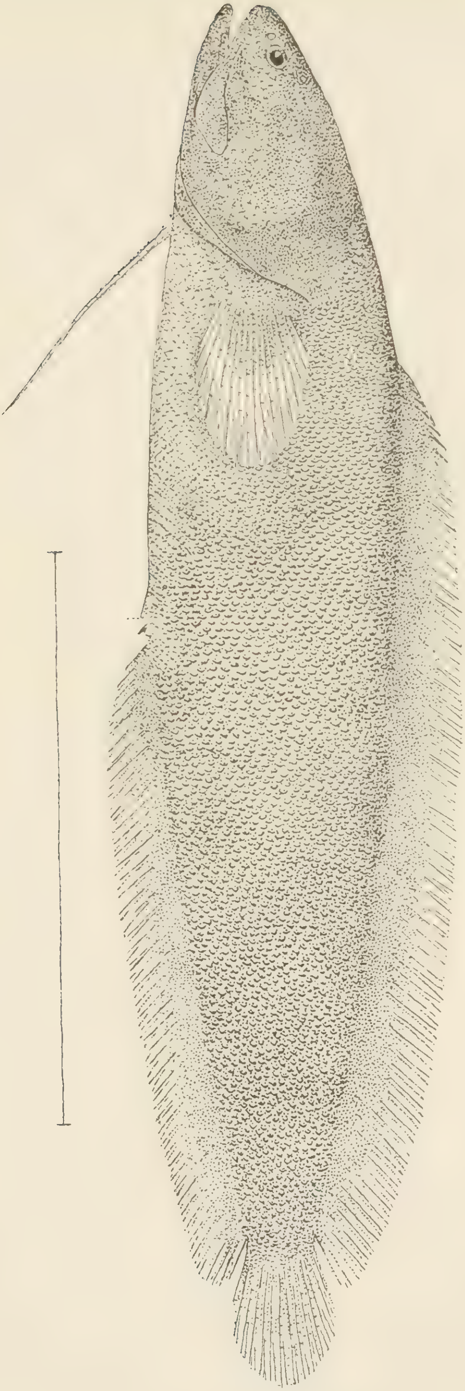
LITH. BRITTON &



ENNEANECTES CARMINALIS.

[illegible] [illegible]

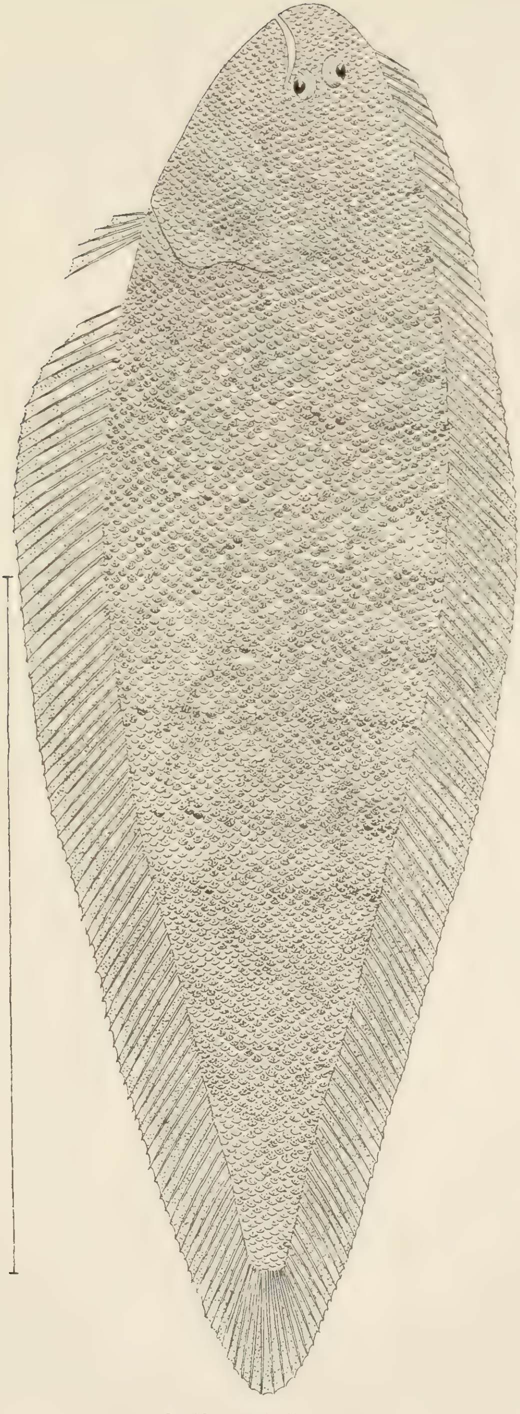
PLATE L



DINEMATICHTHYS VENTRALIS.

[illegible]

[illegible]



SYMPHURUS WILLIAMSI.

Anna L. Brown, del.

Lith. Brit

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FROM

THE HOPKINS SEASIDE LABORATORY

II

ON THE CRANIAL CHARACTERS

OF THE

GENUS SEBASTODES

(ROCK-FISH).

BY

FRANK CRAMER.

Leland Stanford Jr. University,
Palo Alto, California,
1895.

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(Reprint from the Proceedings of the California Academy of Sciences, Series 2, Vol. V.)

Leland Stanford Jr. University,
Palo Alto, California,
1895.

PREFATORY NOTE.

This memoir is the second of a series designed to illustrate the investigations and explorations of the Hopkins Seaside Laboratory, an adjunct of the biological laboratories of the Leland Stanford Junior University. The series is issued under the patronage of Timothy Hopkins, Esq., of Menlo Park, California. The present paper is published with the co-operation of the California Academy of Sciences, appearing simultaneously in its present form and as part of the Proceedings of the Academy.

CHARLES H. GILBERT,
OLIVER P. JENKINS,
Editors.

Date of publication, October 4, 1895.

ON THE CRANIAL CHARACTERS OF THE GENUS SEBASTODES (ROCK-FISH).*

(With Plates lvii–lxx.)

BY FRANK CRAMER.

The rock-fishes of the Pacific, commonly but erroneously called "rock-cod,", constitute a large section of the Scorpænidæ, a family of the mail-cheeked fishes, and present extremely interesting problems in distribution and classification. Fifty or more species have been described during the past forty years from the west coast of North America, between the southern boundary of the United States and Bering Strait. Quite a large number of species also, distinct from the foregoing, have been discovered on the coast of Japan, and all the indications point to many more that are still undescribed. To the southward of the United States the group abruptly disappears, but reappears again in the temperate and cold waters of western South America, which undoubtedly still hold out a rich field for investigation of this group.

The rock-fishes of American waters are characterized by having 13 dorsal spines, while their nearest allies, the rose-fishes *(Sebastes)*, have a larger number. Some of the Japanese forms, however, are described as varying in the number of dorsal spines from 13 to 14. If this is so, the further study of the rock-fishes of the Japanese coast will furnish new and interesting material upon which to base the systematic arrangement of the group, for no such variation is found in all the fifty or more species of the western coast of North America.

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* I wish to thank Prof. Charles H. Gilbert for putting at my disposal the material on which this paper is based, and for generously sacrificing valuable specimens, in order that the series might be made as complete as possible. The collection of skulls is now in the Museum of the Leland Stanford Jr. University.

There has hitherto been no agreement among ichthyologists as to the boundaries of the genera of rose- and rock-fishes. European writers, believing that the difference in the number of dorsal spines is not a sufficient basis for a generic separation of the Pacific forms, include them all in the old Cuvierian genus *Sebastes*. American writers, however, lay greater stress on this difference, which they have shown to be connected with a constant difference in the number of vertebræ. They are also prompted by the desirability of breaking up so large and unwieldy a genus into smaller natural groups, and have thus not only segregated the Pacific forms with 13 dorsal spines and 12+15 vertebræ in the genus *Sebastodes*, but have made several efforts to break up the latter genus into several smaller ones. Between 1854 and 1861 W. O. Ayres[1] described numerous species from the Pacific Coast of California, including them all under the old genus *Sebastes*. In 1861 Gill[2] proposed the genus *Sebastodes* for the *Sebastes paucispinis* of Ayres. In 1862 he placed all the remaining rock-fish of the West Coast in a new genus, *Sebastichthys*, but all the generic characters which he assigned have proved worthless.

Ayres accepted the genus *Sebastodes*, but redefined it so as to include the species *ovalis*, *flavidus*, *melanops* and *pinniger*. It will be seen that this was a natural group, the characters which he selected being correlated with others of which he knew nothing. He retained all the remaining West Coast rock-fish in the genus *Sebastes* "with the characters of *Sebastes* as given by Cuvier, except that the top of the head is always marked by spinous ridges, the orbits being commonly crested, so as to leave a depression between them."

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[1] Ayres: Proc. Cal. Acad. Sci., 1854–1862.

[2] Gill: Proc. Acad. Nat. Sci. Phil., 1861, p. 165; 1862, p. 329.

In 1864 Gill[3] separated the then known rock-fishes of the Pacific Coast into four genera: *Sebastodes, Sebastichthys, Sebastosomus and Sebastomus.* The groups which he thus indicated form natural assemblages of species, but thus far he has never defined them satisfactorily. The genera proposed by him have generally been accepted as of subgeneric value by later workers in the group, but with a knowledge of the early known species which Gill was unable to examine, together with many others discovered since, they have found it impossible to draw the lines of generic separation indicated by him.

In 1880 Jordan and Gilbert[4] discovered and described fifteen or more new species, and adopted a more definite terminology for the spinous ridges of the cranium, which seemed to them to furnish the most reliable characters. The arrangement adopted by them on the basis of these characters agreed in the main with the generic grouping already proposed by Gill. Since, therefore, the characters furnished by the top of the head had been most relied upon for the grouping of the species, and it was still a mooted question whether they should all be included in one genus or distributed among several, it seemed to the writer desirable to make a detailed examination of a series of skulls in order to determine what other cranial characters, if any, were correlated with those of the top of the head, and whether there were any gaps in the series which would serve as points of separation into genera.

As will be seen later, the writer has been unable to discover a basis for such generic separation and is convinced that the cranial characters fail to indicate such. Since the present investigation was completed, however, an attempt has been made by Eigenmann and Beeson * along the same lines, and with opposite results. It therefore becomes necessary to examine their conclusions in some detail. As a basis for the primary division of the group, they have selected the condition of the parietals, classifying the species according as their parietals meet or do not meet above the supraoccipital. The character is elsewhere described as the "union or non-union of the parietals," and the statement made that "the value placed on such a character .... need not be defended here." During the course of his investigation the writer also attempted to make use of this variation in the extent of the parietals, but came to the conclusion that it had little, if any, taxonomic value. The inner edges of the parietals are strictly superficial in position, overlapping the supraoccipital. Their inner margins are irregular, and the extent of the lap somewhat variable within the limits of each species, depending both on original individual variations and on the extent to which the thin edges of the bones have been absorbed. Taking a series of species, we have presented every degree of approximation of these margins, from the condition where they are wide apart and leave exposed a broad strip of the supraoccipital, to that in which they touch, meet, or overlap. Union is never effected between the parietals and it is misleading to speak of such. The manner in which the parietals reach or pass over the middle line is so variable as to suggest anything but genetic relationship. In a few species the inner edges of the parietals are parallel and seem to abut against each other in the middle line, in others the inner outlines are curved and the left parietal overlaps the right. In some cases

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[3] Gill: Proc. Acad. Nat. Sci. Phil. 1864, p. 145.

[4] Jordan & Gibert: Proc. U. S. National Museum, 1880, p. 287.

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* Preliminary Note on the Relationship of the Species Usually United Under the Generic Name Sebastodes: C. H. Eigenmann and C. H. Beeson. American Naturalist, vol. xxvii, pp. 668–671, July, 1893. For convenience of reference this paper is given in full in the appendix, which see.

one of the parietals reaches the middle line and the other does not; in other cases the posterior part of one parietal and the anterior part of the other reach the middle line, and yet a wide strip of supraoccipital separates the two bones throughout their length. All of these conditions are evident in the accompanying figures. There is no more reason why that condition of the parietals in which they barely meet should be chosen as the line of separation between two groups of species than that any other degree of approximation or overlapping should be chosen. The character is unfitted *a priori* to serve as a primary character. The kind of difficulties into which its adoption leads is illustrated, among other instances, by the fact that *S. elongatus* and *S. levis* are placed in the group with separated parietals, although in some individuals the parietals plainly meet.

Not only is the condition of the parietals, by the nature of the character, unsuited for the purpose which it is made to serve, but it is not correlated with a single other important cranial character. After it is adopted as the primary character it does not serve in the slightest degree as a key to the rest of the structure. The degree of development of the cranial spines and ridges, the condition of the interorbital space, the curvature of the base of the skull, the condition of the ventral process of the basisphenoid and the direction of the mesethmoid processes are all closely correlated with each other and all lead to the same arrangement of species. The condition of the parietals not being correlated with a single other character, its use as a primary character is bound to rupture all the correlations that do exist; and that is what it does. To select a single illustration from among a host of them, the genus *Sebastomus*, as made up by Eigenmann and Beeson, includes species from all parts of the group:

rosaceus, *ruber*, *constellatus*, etc., with concave interorbital space, straight base of skull, and strong spines and ridges; and *miniatus* and *pinniger* with convex interorbital space, curved base of skull, weak spines and ridges and depressed mesethmoid processes. In every point of structure and conformation of skull the last two species are most closely related to the species placed in the genera *Primospina*, *Sebastosomus* and *Acutomentum;* and are widely separated from the other species of the genus *Sebastomus*.

The condition of the parietals was the first character selected by the writer as a basis for the arrangement of the species, but it was soon found unreliable from every point of view and had to be rejected; and the further the investigation proceeded the more clearly was its rejection justified. An examination of all the cranial characters in a large number of species will invariably lead to the same result.

Of the fifty or more species recognized from the Pacific Coast of America, the following thirty-two have been examined by me: *S. paucispinis*, *goodei*, *mystinus*, *melanops*, *flavidus*, *entomelas*, *ovalis*, *atrovirens*, *pinniger*, *miniatus*, *introniger*, *aurora*, *chlorostictus*, *rosaceus*, *constellatus*, *rhodochloris*, *ruberrimus*,* *saxicola*, *diploproa*, *elongatus*, *rubrivinctus*, *levis*, *serriceps*, *rastrelliger*, *auriculatus*, *vexillaris*, *caurinus*, *maliger*, *carnatus*, *chrysomelas* and *nebulosus;* besides two or three unidentified skulls. The following West Coast species were not available: *ciliatus*, *proriger*, *brevispinis*, *umbrosus*, *nigrocinctus*, *alutus*, *serranoides*, *rufus*, *melanostomus*, *rupestris*, *eos*, *æreus*, *gilli*, *zacentrus*, *sinensis*.

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* The specific name *ruberrimus* is here proposed as a substitute for the *ruber* of recent authors, not of Ayres, which latter must be regarded as a synonym of *auriculatus*. That the specimens to which the name *ruber* was first applied belonged to the species *auriculatus* is clearly shown by the careful description of the spines on the top of the head. The statements concerning color and size do not apply to *auriculatus*, but apply equally well to each of the three species *ruberrimus*, *pinniger* or *miniatus*. (Ayres, Proceedings California Academy of Sciences, vol. i, p. 7, 1854.)

The series upon which the following conclusions are based consisted of fifty-one skulls of thirty-two different species. Although many skulls could not be procured, the series is essentially complete, containing representatives from all parts of the group.

The cranial characters that have hitherto proved useful relate to the cranial ridges and the spines in which they end. The characteristic spines and ridges are: the preocular on the anterior superior border of the orbit; the supraocular, near the edge of the frontal bone above the middle of the orbit; the postocular, behind the supraocular, and the tympanic, behind the postocular on the frontal bone near the superior posterior angle of the orbit; and the parietal, present in all the species, a longitudinal ridge on the middle of the parietal bone. Of these ridges all may be absent except the parietal,* and in the different species in which they are present differ exceedingly in the degree of their development.

In a comparison of the crania some characters which it was at first supposed would furnish good marks by which to subdivide the genus into groups, proved otherwise. The thickness of the bones of the skull is generally correlated with other characters, rather thin papery skulls bearing strongly developed bony ridges, while thicker and more bony skulls have the ridges low or obsolete. But there are several exceptions to the rule. Other characters at first seem important, but as they occur in a few species only, far apart in the series, they must be regarded as sporadic: thus nuchal spines are present in *S. levis*, *chlorostictus*, *aurora* and *constellatus* (in the last species connected with a tendency of the ridges to break up into spines and tubercles), but they are inconstant even in the species in which they occur: so that it is doubtful whether they are always present in any species. The coronal spines, likewise inconstant, are usually present in *S. aurora*, and nearly always present in *S. auriculatus*.

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*Prof. Eigenmann has changed the name of this ridge and its spine from "occipital" to "parietal," and I have adopted his name for it, because it seems much more appropriate.

In some species in which pairs of spines are normally absent, these are sometimes present in a rudimentary or distorted form, either singly or in pairs. Although the *paucispinis* group is characterized by the absence of the usual pairs of spines in adults, two adult *paucispinis* skulls had a rudimentary supra- or postocular on the left side, and a very young skull of this division had rudimentary tympanic spines on both sides and a postocular on the left side: a medium-sized *melanops* had a rudimentary right tympanic; and a large one had a pair of postoculars and a deformed left supraocular; a young *flavidus* had a rudimentary right postocular; in an *elongatus*, in which the supraoculars are normally absent, the spines were still present in the form of low humps on the ridge; in another specimen the supraocular spine was sharp and perfectly distinct.

Hilgendorf expressed the belief that when one of the three pairs of spines (supraocular, postocular and tympanic) is absent, it is the supraocular and not the postocular that has disappeared.* This is proved by several

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*Hilgendorf: Uebersicht uber die japanischen Sebastes-Arten, Sitzungs-Bericht der Gesellschaft Naturforschenden Freunde zu Berlin, 21. Dec., 1880, p. 168. "Das maximum von Dornen am Oberkopf kommt bei *S. marmoratus* vor, namlich einer in der Nasengegend, der nasaldorn, drei auf dem Augenrand, Orbital-dornen, von denen der mittlere bei den andern Arten zuerst verschwindet."

series of facts. When the three spines are present together, the distance from the base of the tympanic to the base of the supraocular on the one hand, and the distance from the supraocular to the preocular on the other hand, are to each other in many species as 1 to 1, varying from this ratio to 1 to 3 in *rosaceus;* while where one of the spines is absent, the relative distances vary from 3 to 10 to 3 to 15 (except *nebulosus*, 2 to 5). These measurements give the all but invariable rule that, when one of the spines is absent the so-called supraocular occupies the position of the postocular. When both the supraocular and postocular are present and differ in size (which is usually the case), the supraocular is invariably weaker than the postocular. The depression between the tympanic and postocular is always deep, while between the postocular and supraocular there is frequently a well-marked ridge (*chlorostictus*, *rhodochloris*, *ruberrimus*). In *levis* the true supraocular is usually present; in the skull at hand it was absent, but on one side a blunt knob occupied the position required by the rule of relative distances, and just behind this point, on both sides, there was a depression in the otherwise continuous ridge, marking the depression between the supra- and postoculars. In the skull of *elongatus*, in which one of the pairs of spines is normally absent, there is a low, conical rudimentary spine on the left side, occupying the position of the supraocular, as required by the rule of relative distances. These facts, taken together, seem to establish the conclusion that when one of the trio of pairs of spines is absent, the supraocular spine has disappeared, and the supraocular ridge merged with the postocular.

A source of error that had to be studiously avoided in the comparison of species is that due to the changes that take place with increasing age. Of these, the following are among the most constant: The bones of the skull grow thicker and in very large specimens become spongy. The processes of the mesethmoid become depressed; and the ventral process of the basisphenoid, when present at all, sometimes suffers complete, and always partial absorption. The interorbital space grows relatively wider, this being one of the most striking and constant variations. In the present paper the width of this space is always given as measured at its narrowest part (which usually falls immediately behind the preocular spines), and compared with the total length of the base of the skull. In a young *vexillaris*, the ratio of interorbital width into the length of the base of the skull is $5\frac{1}{4}$, in a medium-sized one $4\frac{8}{9}$, and in a large one 4. In a young *maliger* it is $4\frac{4}{5}$, in an old one $4\frac{1}{3}$; in a young *miniatus* $3\frac{4}{7}$, in an old one $3\frac{1}{11}$; in a young *flavidus* $3\frac{7}{15}$, in an old one 3. In a very young *ruberrimus* it is $6\frac{4}{7}$, in one two or three times as large $5\frac{2}{7}$, in one in which the cranial ridges are almost competely serrated 5, and in a very large, old specimen $4\frac{5}{22}$.

The degree of approximation of the parietals seemed at first to be a valuable character, and it will be seen from the key given below that in several parts of the group closely related species have the parietals in contact; but while it serves well as a character of subordinate importance, the mere fact that any two species have parietals which meet or overlap is no proof of affinity unless it is supported by other agreements.

The most reliable cranial characters for the purpose of classification of the species are: the degree of curvature of the base of the skull; the convexity or concavity of the interorbital space and its relative width; the direction of the mesethmoid processes; the degree of development of the ventral process of the basisphenoid; and the strength or weakness of the cranial ridges. These characters are closely correlated, and furnish the only basis for the arrangement of the species within the genus. In the *paucispinis*, *melanops* and *pinniger* groups (see classification below) the base of the skull is strikingly curved; the interorbital space is always convex (at most flat, never concave) and relatively wide, its width never being more than 3½ in the length of the base of the skull; the mesethmoid processes are never directed upward; the ventral process of the basisphenoid is absent, or reduced to a mere point or at most occasionally present in very young specimens; the cranial ridges are poorly or not at all developed and the spines are delicate or absent. In the *rosaceus-nebulosus* groups the base of the skull is straight or nearly so; the interorbital space is always concave and narrow, its ratio in the base of the skull varying from 4¼ to $6\frac{1}{7}$; the mesethmoid processes are always directed more or less upward; and the ventral process of the basisphenoid, the cranial ridges and the spines are strongly developed.

These two groups of characters would furnish an ample basis for the division of the genus into two, if the species mentioned were alone to be considered. But between the two groups distinguished by these characters lies another (*introniger-aurora*) in which the base of the skull is somewhat curved (approaching straightness), the interorbital space is flat or slightly concave, of medium width, 4 to 4½ into the base of the skull, the processes of the mesethmoid are directed but little upward and the ventral process of the basisphenoid is poorly developed. By the interposition of this group it is possible to arrange a series from *paucispinis* to *rosaceus* in which there is an almost perfect gradation of all the above-mentioned characters, from strikingly curved to straight base of skull, from convex and broad to concave and narrow interorbital space, from mesethmoid processes depressed to those directed forty-five degrees above the dorsal plane of the skull, from a rudimentary to a fully developed ventral process of the basisphenoid and from nearly obsolete to strongly developed cranial ridges.

The single species *ruberrimus* furnishes at different stages in its development a series of characters that parallel in a striking way the series just described. The very young skull is so much like those of *rosaceus* and *rhodochloris* that, if it were the only *ruberrimus* at hand, it might easily be put between them in a series. The width of the interorbital space is $6\frac{4}{7}$ into the base of the skull, relatively narrower than that of any other skull in the collection of fifty, and deeply concave; the mesethmoid processes are directed upward and the ventral process of the basisphenoid is well developed. The very large skull of the same species is almost exactly adapted to the description of the *aurora-introniger* group. The interorbital space is perfectly flat and $4\frac{5}{22}$ into the base of the skull, the mesethmoid processes extend forward nearly horizontally and the ventral process of the basisphenoid is rudimentary. The gap between these two extremes is completely closed by skulls of intermediate age.

S. saxicola and *diploproa* constitute another intermediate group with the base of the skull markedly curved, the interorbital space slightly convex or flat, of medium width, $3\frac{3}{4}$ to $4\frac{1}{4}$ into the base of the skull, mesethmoid processes directed but little upward, and the ventral process of the basisphenoid rudimentary or fairly developed. This intermediate group, unlike the other, lacks the supraocular spine and probably forms one of the links between the *entomelas-pinniger* group and the other rockfish in which the supraocular is wanting.

The following classification, based exclusively on cranial characters, summarizes what has been said and includes some details not hitherto mentioned:

A. Base of skull markedly curved. Interorbital space convex or flat, broad, less than 3½ in the base of the skull. Processes of mesethmoid not directed upward. Ventral process of basisphenoid rudimentary. Cranial ridges obsolete or weak, spines absent or delicate.
  a. Cranial ridges (except parietal) obsolete or very slightly developed. Cranial spines absent or very inconstant and weakly developed.
    b. Parietals not meeting; mesethmoid processes weak and depressed; skull moderately thick; parietal ridges weak, with minute spines or none; other ridges none.
      c. Interorbital space plainly convex, *paucispinis*.
      cc. Interorbital space nearly flat, *goodei*.
    bb. Parietals meeting in the middle line, but separated posteriorly by a wedge-shaped exposure of the supraoccipital. Mesethmoid processes better developed, straight and horizontal; skull thick; the bones striated; parietal ridges low, spineless, other ridges none.
      d. Preocular spines none, *flavidus*, *melanops*.
      dd. Preocular spines present, *mystinus*.
  aa. Cranial ridges somewhat developed; preocular, supraocular, postocular, tympanic and parietal spines present, all delicate; ventral process of basisphenoid sometimes present in young. (Tympanic spines usually absent or imperfect in *atrovirens*.)
    e. Parietals not meeting; interorbital space usually plainly convex; bones thick, more or less striated.
      f. Supraocular spine present.
        g. Base of skull strikingly curved; parietals nearly meeting, *entomelas*, *ovalis*.
        gg. Base of skull less strikingly curved; parietals well separated.
          h. Interorbital space plainly convex, *pinniger*.
          hh. Interorbital space flat or nearly so, *miniatus*.
      ff. Supraocular spine absent; parietals well separated; interorbital space but little convex; mesethmoid processes directed somewhat upward, *atrovirens*.

B. Base of skull markedly curved. Interorbital space flat or slightly concave, of medium width, 3¾ to 4¼ in base of skull. Processes of mesethmoid directed but little upward. Ventral process of basisphenoid rudimentary or fairly developed.
  h. Cranial ridges fairly developed, supraocular spines absent, skull thin, papery, mesethmoid processes horizontal.
    i. Parietals not meeting. *saxicola*.
    ii. Parietals meeting. *diploproa*.

C. Base of skull nearly straight (slightly curved). Interorbital space flat or slightly concave, of medium width, 4 to 4½ in base of skull. Processes of mesethmoid directed but little upward. Ventral process of basisphenoid rudimentary or poorly developed. Cranial ridges and spines quite strong.

j. Cranial ridges well developed. Preocular, supraocular, postocular, tympanic, parietal and nuchal spines present. Coronal spines usually present. *introniger, aurora.*

D. Base of skull straight or nearly so. Interorbital space concave and narrow, 4¼ to $6\frac{1}{7}$ in base of skull. Processes of mesethmoid directed upward. Ventral process of basisphenoid well developed. Cranial ridges high and strong.

k. Supraocular spine present. Parietals not meeting.

l. Skull thick; cranial ridges broken into tubercles and spines; interorbital space flat; mesethmoid processes horizontal; ventral process of basisphenoid rudimentary in adult (the skull of young almost exactly as in *rosaceus;* see below). *ruberrimus.*

ll. Skulls somewhat papery; ridges smooth; interorbital space concave; mesethmoid processes directed upward; ventral process of basisphenoid well developed in both young and old. *constellatus, rosaceus, rhodochloris, chlorostictus.*

kk. Supraocular spine absent.

m. Interorbital space not widening markedly backward.

n. Parietals not meeting; skull papery. *elongatus.*

nn. Parietals meeting; skull bony.

o. Nuchal spines none. *rubrivinctus, levis.*

oo. Nuchal spines present; ridges thick and high. *serriceps.*

mm. Interorbital space widening markedly backwards; parietals not meeting.

p. Coronal spines present, skull bony. *auriculatus.*

pp. Coronal spines none.

q. Skull thick; bones striated; interorbital space slightly convex. *rastrelliger.*

qq. Interorbital space concave and the cranial ridges strong and high. *vexillaris, maliger, carnatus, chrysomelas, nebulosus.*

The interorbital space becoming more concave and narrower and the ridges stronger and higher from the beginning to the end of the series.

It has been impracticable in some cases to separate closely related species in the above classification according to cranial characters, some of them agreeing even in color patterns and differing only in colors and other details, and showing no tangible differences in the skulls.

S. serriceps is probably placed a little too high up in the series, as its other characters indicate closer connections with the last group. It is evident that the cranial characters do not furnish a basis for the division of the rockfishes of the West Coast into several genera. All the characters that are at all available for purposes of classification serve remarkably well for arranging the species in series, but the changes which those characters undergo in the successive species are so perfectly graduated that they cannot be used to break up the genus. Jordan and Gilbert[5] first grouped the species in 1883, using the number and degree of development of the cranial ridges and spines as principal characters. Their arrangement not only remains, but is more firmly established, with one or two doubtful exceptions, by the remaining cranial characters.

Connected with this series of cranial characters and their modifications are a number of other characters. Although the correlations are not always exact, an arrangement of species based on these external characters would differ but little from that given above.

Ayres long ago pointed out that "the border of the caudal fin changes insensibly in the successive species from the slight emargination of *paucispinis* to the slight rounding of *nigrocinctus*." In *paucispinis* the anal spines are graduated, but this feature gradually changes in the series until in the *rosaceus* group the second anal spine is longer than the third. In the group represented by *paucispinis* and *pinniger* the longest rakers on the anterior limb of the first arch are relatively much longer than in the group represented by *rosaceus*, etc. The decrease in length is gradual in the series and is quite closely correlated with the decrease in the number of rakers on the anterior limb.

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[5] Jordan & Gilbert: Synopsis of the Fishes of North America, 1883, pp. 652-678.

The scales also become successively larger, from very small ones in *paucispinis* to large scales in *introniger*. But it is impossible to use the size of the scales for the purpose of generic distinction. In the whole genus the transverse rows of scales corresponding in number with the pores are very oblique (making an angle of about forty-five degrees with the vertical) and have rarely, if ever, been counted as the "transverse rows of scales." Besides these there is a series that is actually vertical, making an angle of about forty-five degrees with the former. For each "oblique transverse" row there are two plainly visible vertical rows, and as a scale for each of the latter rows lies upon or nearly upon the lateral line these have been depended on for the determination of the "transverse rows of scales." Occasionally the scale of a vertical row lies far enough above or below the row of pores to be left out of the count, although the row to which it belongs is continuous above and below the line. This counting of the scales on the lateral line instead of the vertical rows to which they belong has led to confusion, because no two specimens of the same species give similar results.

It is an easy matter to arrange the species in a probably natural order; but, even with the fine series of graduated characters described above, it has been impossible to construct a "genealogical tree." The genus is probably a young and vigorous one; and extensive comparisons of the young stages of the different species with the adult condition, comparison of the different species with each other at different ages, and a study of the later embryonic stages of these ovoviviparous fishes, together with the few facts now known, would in a large measure solve the problem of genetic relationship in this interesting group.

I include below a diagnosis of the genus, with an analysis of the North American species.

SEBASTODES* Gill.

Rock-Fish; "Rock-Cod."

(*Sebastosomus*, *Sebastomus*, *Sebastichthys* Gill; *Acutomentum*, *Primospina*, *Pteropodus*, *Auctospina* Eigenmann and Beeson.)

(Gill, Proc. Acad. Nat. Sci. Phila., 165, 1861: type *Sebastes paucispinis* Ayres; Jordan and Gilbert, Synopsis of Fishes of North America, 652, 1883.)

Body and head somewhat compressed; head large, $2\frac{2}{5}$ to $3\frac{2}{3}$ in length of body†; depth $2\frac{1}{4}$ to $3\frac{3}{4}$ in length of body; mouth moderate or large, with the jaws equal or the lower more or less projecting; the maxillary reaching middle of eye or beyond, sometimes beyond posterior edge of orbit, its length from $1\frac{3}{4}$ to 3 in length of head; teeth in villiform bands on jaws, vomer and palatines. Head more or less evenly scaled, without dermal flaps; interorbital space convex or concave, widening markedly with age; cranial ridges‡ more or less developed, one or more of the following pairs always present, usually ending in spines: preocular, supraocular, postocular, tympanic, coronal, parietal and nuchal. Five preopercular and two opercular spines: one to three spines on the suprascapula. Suborbital stay moderate, usually not reaching preopercle. Gill-rakers various, very long and slender to very short. Scales moderate or small, mostly ctenoid, 35 to 100 transverse series. Dorsal fin continuous, emarginate, its formula XIII–12 to 16. Anal fin III, 5 to 9. Pectorals well developed, the base broad or narrow, the lower rays undivided. Caudal slightly rounded, truncate or slightly forked; soft parts of vertical fins more or less scaly. Pyloric cœca 6 to 11. Vertebræ 12+15. Species of varied, often brilliant colors, mostly red. Sexes colored alike. The group inhabits the two shores of the northern Pacific Ocean. Some of the species are extremely localized, and they are exceedingly abundant in rocky places along the west coast of the United States. They seem to disappear rather abruptly to the south of southern California, and the number of species dwindles northward; none are arctic, the bulk of the group inhabiting temperate waters. The bathymetric range of most of the species is rather limited; some live in shallow water along shore, the majority frequent rocky reefs at depths of 50 to 500 feet; a few species have been taken at a depth of 1600 feet. All are ovoviviparous, bringing forth great numbers of young, which are nearly half an inch in length when born. The species differ greatly in form and armature, but the genera based on these differences intergrade too closely to be worthy of retention. (σεβαστός, Sebastes; εἶδος, likeness.)

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* A very doubtful species, which may be the young of *Sebastes marinus*, with an abnormal number of spines, is accredited to the Atlantic Coast, viz.: *S.? fasciatus* (Storer). "Body elongated, not convex in front of dorsal fin as in *Sebastes norvegicus;* four distinct dark brown transverse bands upon the sides, the broadest at the posterior portion of the body." D. XIII–14; A. III, 7. Provincetown, Mass. (Storer). (*Sebastes fasciatus* Storer, Proc. Bost. Soc. Nat. Hist., v, 31, 1854.)

An equally doubtful fossil species is referred to this genus, viz.: *Sebastodes (?) rosæ* Eigenmann. It is known only from a fragment, the horizontal limb of a preopercle, which was found at Port Harford, Cal., among various tertiary fossils, thirty feet above the sea; but the finder himself thinks it *may have been left* there by the Indians. *(Sebastodes (?) rosæ* Eigenmann, Zoe, i, 16, 1890.)

†Length of body is measured from tip of snout to base of caudal fin.

‡For illustrations of cranial ridges and spines, see explanation of plates.

ANALYSIS OF NORTH AMERICAN SPECIES OF SEBASTODES.

a. Interorbital space convex (never concave), broad, less than $3\frac{1}{2}$ in base of skull, cranial ridges very low or obsolete, the spines when present, delicate; base of skull strongly curved, mesethmoid processes not elevated (not directed upward), ventral process of basisphenoid rudimentary (or fairly developed only in young); skull usually thick; anal rays III, 9 to III, 6; gill-rakers usually long and slender; snout, preorbitals and jaws more or less scaly.

  b. Cranial ridges (except parietal) all obsolete or very slightly developed, cranial spines absent or very inconstant and minute (regularly present only in young), (preocular spines usually present in *mystinus*); lower jaw much projecting.

    c. Parietal bones not meeting, mesethmoid processes weak and depressed; scales small, 90–100 transverse series of scales above lateral line, peritoneum white, lower jaw much projecting, entering profile, a large symphyseal knob, directed forward. A. III, 8–III, 9.

      d. Head $2\frac{2}{3}$; depth $3\frac{3}{4}$; D. XIII–13; A. III, 9; lat. l. tubes 65–80, transverse rows of scales about 100. Maxillary reaching beyond eye (in adult), $1\frac{3}{4}$ in head; lower jaw much projecting, with a large symphyseal knob, eye large, 4–6 in head. Scales very small, irregular. Anal spines small, graduated. Pale dull orange red, dark brown above; young olivaceous. Peritoneum white. San Diego to San Francisco, abundant, and to British Columbia (Bean). *paucispinis.**

      dd. Head, $2\frac{4}{5}$; depth, $3\frac{2}{3}$. D. XIII–14; A. III, 8; lat. l. 55 (pores), transverse rows of scales above lat. l. about 90. Maxillary reaching little beyond middle of orbit, $2\frac{1}{3}$ in head; lower jaw much projecting, with large symphyseal knob. Eye $3\frac{3}{5}$ in head; nasal spine obsolete; interorbital width $4\frac{1}{4}$ in head; anal spines, short, strong, graduated. Scales rough-ctenoid. Dusky olivaceous, silvery below, flushed with red. Peritoneum white. San Diego to San Francisco. *goodei.*†

    cc. Parietal bones usually meeting, mesethmoid processes better developed, straight, not elevated.

      e. Peritoneum white; dorsal fin deeply emarginate.

        f. A. III, 9.

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* *Sebastes paucispinis* Ayres, Proc. Cal. Acad. Sci., i, 6, 1854.

† *Sebastodes goodei* Eigenmann and Eigenmann, Proc. Cal. Acad. Sci., 12, 1890.

g. Pectorals broad reaching tips of ventrals, but not quite to vent. Head 3; depth 3. D. XIII–15; A. III, 9; lat. l. about 60. Maxillary reaching nearly to posterior margin of eye, 2 in head; lower jaw much projecting, with large symphyseal knob. Scales medium. Anal spines low, graduated, second as long as eye; olivaceous; caudal yellowish or greenish. Peritoneum white. San Diego to San Francisco, abundant. *flavidus.*[*]

gg. Pectorals not reaching tips of ventrals, not nearly to vent. Head 3; depth about 3⅖. D. XIII–15 or 16, A. III, 9; lat. l. 60 (pores). Elongate. Lower jaw projecting, entering profile. Eye 4½ in head, 1¼ in interorbital space. Scales large, those of head greatly reduced. Anal spines slender, graduated. Gray of varying shades, back darker; a series of large white blotches along sides of back, much more marked in some than in others; fins yellowish. Cortes Banks to San Francisco. *serranoides.*[†]

ff. A. III, 8; head 3; depth 2⅔. D. XIII–16; lat. l. 53, transverse rows of scales 60–70. Maxillary nearly reaching posterior margin of orbit, a little less than two in head; lower jaw projecting, its tip entering profile. Eye large. Scales moderate, accessory scales numerous. Anal spines small, graduated. Olive brown, dark above; upper part of sides thickly marked with small slaty-black spots; caudal dark. Peritoneum white. Monterey to Sitka, abundant northward. *melanops.*[‡]

ee. Peritoneum black, colors dusky, fins blackish, dorsal fin not very deeply emarginate.

h. Head 3⅛; depth 3⅛. D. XIII–15; A. III, 8; lat. l. 66. Maxillary reaching posterior margin of pupil; lower jaw somewhat projecting, without prominent knob. Scales all ctenoid. Second anal not longer than third. Preocular ridges obsolete; frontal region not specially convex. Blackish green, sides rather pale. Peritoneum black. Coast of Alaska. *ciliatus.*[§]

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[*] *Sebastodes flavidus* Ayres, Proc. Cal. Acad. Sci., 209, fig. 64, 1862.

[†] *Sebastodes serranoides* Eigenmann & Eigenmann, Proc. Cal. Acad. Sci., 36, 1890.

[‡] *Sebastes melanops* Girard, Proc. Acad. Nat. Sci. Phila., viii, 135, 1854, and U. S. Pac. R. R. Surv. Fish. 81.

[§] *Epinephelus ciliatus* Tilesius, Mem. Acad. Sci. St. Petersb., iv., 474, 1810.

hh. Head 3⅓; depth 2¾. D. XIII–15; A. III, 9; lat. l. 66; 50–55 tubes. Maxillary dilated behind, reaching posterior margin of pupil, 2⅕ in head; lower jaw protruding. Anal spines graduated, the second 3½ in head. Preocular ridges present, usually ending in spines, frontal region between them bulging. Slaty black; paler below lateral line. Peritoneum black. Puget Sound to San Diego, abundant. *mystinus.*[*]

bb. Cranial ridges somewhat developed, preocular, postocular, tympanic and parietal spines usually all present, delicate (supraocular also present in some species; tympanic usually absent in *atrovirens*); lower jaw projecting, parietal bones usually not meeting.

i. Lower jaw much projecting, scales rather small; lat. l. 50–75: anal rays III, 7–III, 9; dorsal fin not deeply emarginate, soft dorsal low.

j. Second anal spine scarcely or not longer, usually shorter than third.

k. Supraocular spine wanting. Head 3¼; depth 3⅓. D. XIII–15; A. III, 8; lat. l. 65. Maxillary reaching middle of eye, 2⅓ in head; lower jaw protruding, its tip entering profile. Eye less than interorbital space, 4 in head. Anal spines graduated. Olive green; creamy below; fins dusky. Peritoneum black. Port Harford to Monterey, rare. *entomelas.*[†]

kk. Supraocular spine usually present.

l. Peritoneum black.

m. Maxillary reaching middle of eye. Head 3; depth 3½. D. XIII–14½; A. III, 8½; 56 pores in lateral line. Compressed, elongate; mandible with prominent symphyseal knob. Orbit 3½ to 4 in head. Head entirely covered with moderate-sized scales; those of body larger. Anal spines graduated. Rufous; variously marked with brown; caudal dusky. Peritoneum jet black. Cortes Banks, San Diego. *rufus.*[‡]

mm. Maxillary reaching posterior margin of eye, 2 in head. Head 3 in total length; depth 3¾. D. XIII–13½; A. III, 7½. Elongate; head pointed; lower jaw projecting. Mandible, maxillaries and snout scaled; scales of head small, ctenoid, those of body larger. Anal spines graduated. Mostly black above, lat. l. vermillion; a black band below it. Peritoneum black. San Diego. *macdonaldi.*[*]

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[*] *Sebastichthys mystinus* Jordan & Gilbert, Proc. U. S. Nat. Mus., 455, 1880; 56, 70, 1881.

[†] *Sebastichthys entomelas* Jordan & Gilbert, Proc. U. S. Nat. Mus., 142, 1880.

[‡] *Sebastodes rufus* Eigenmann & Eigenmann, Proc. Cal. Acad. Sci. 13, 1890.

ll. Peritoneum white. Closely allied to *Sebastodes proriger*, but larger in size and more uniform in color; anal spines graduated. Coast of Alaska. *brevispinis.*[†]

jj. Second anal spine notably longer than third. Peritoneum black.

n. Supraocular spines usually present.

o. Head 3; depth 2¾. D. XIII–14; A. III, 8; lat. l. about 70. Body ovate. Maxillary reaching posterior edge of pupil, 2½ in head; lower jaw considerably protruding. Eye slightly longer than snout. Maxillary and mandible scaly. Second anal spine longer and stronger than third, 2⅓ in head. Creamy olivaceous; upper fins greenish, lower yellowish, mostly dark edged. Young more green. Peritoneum black. San Diego to San Francisco, rare. *ovalis.*[‡]

oo. Body elongate; depth more than 3; pores of lat. l. 50–52.

p. Head 3; depth 3⅖; D. XIII–14; A. III, 7; transverse rows of scales about 52; pores of lat. l. about 51. Maxillary reaching center of pupil, about 3 in head; lower jaw much projecting, with prominent symphyseal knob. Orbit 3½ in head. Scales everywhere strongly ctenoid, rather small; accessory scales not very numerous. Pectorals not reaching vent. Cranial spines very weak, often absent. Colored more or less like *ovalis*. Peritoneum black. Pacific Grove, Cal.; rare. *hopkinsi.*[§]

pp. Head 2⅔; depth 3⅕. D. XIII–15; A. III, 8; lat. l. 50 (tubes). Maxillary reaching middle of pupil, 2⅓ in head. Eye 3¼ in head; interorbital space 1⅓ in orbit; scales small, rough, much smaller above lateral line, irregular; scales smooth on breast, snout, maxillary and mandible. Second anal spine much stronger and longer than third, 2⅓ in head. Pectorals reaching vent. Dusky above, with faint traces of darker blotches along back. Santa Barbara Islands. *alutus.*[||]

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[*] *Sebastodes proriger* Eigenmann & Eigenmann (not of Jordan & Gilbert), Proc. Cal. Acad. Sci., 15, 1890, and *Acutomentum macdonaldi* Eigenmann & Beeson, Amer. Naturalist, 669, 1893.

[†] *Sebastichthys proriger* var. *brevispinis* Bean, Proc. U. S. Nat. Mus., 359, 1883.

[‡] *Sebastodes ovalis* Ayres, Proc. Cal. Acad. Sci., 209, 212, fig. 65, 1862.

[§] sp. nov. A full description will soon be published elsewhere.

[||] *Sebastichthys alutus* Gilbert, Proc. U. S. Nat. Mus., 76, 1890.

nn. Supraocular spines absent. Head 3; depth 3⅓. D. XIII-13; A. III, 7; lat. l. 75. Maxillary short, broad, reaching beyond middle of eye, 2¼ in head; lower jaw much projecting, with large symphyseal knob. Eye very large, longer than snout. Body rather elongate. Second anal spine much longer and stronger than third, 2⅓ in head. Color chiefly red; lateral line running in a continuous red stripe; iris red. Peritoneum black. San Diego to San Francisco, not rare. *proriger.*[*]

ii. Lower jaw little projecting; scales moderate; lat. l. 45–55; A. III, 7–III, 6.

q. Supraocular spine present; A. III, 7; color red.

r. Color chiefly orange; head 2⅔; depth 2⅗; D. XIII–14; A. III, 7; lat. l. 48. Maxillary reaching posterior margin of eye, 2 in head; lower jaw somewhat projecting, with a symphyseal knob; eye 4 in head. Accessory scales numerous; scales on mandible smooth. Anal spines graduated, the second 3 in head. Peritoneum pale. San Diego to Puget Sound, abundant. *pinniger.*[†]

rr. Color chiefly brick red. Head 2¾; depth 3; D. XIII–14; A. III, 7; lat. l. 47. Maxillary reaching past pupil, 2 in head; lower jaw somewhat projecting, with a moderate symphyseal knob. Scales rough-ctenoid; those on mandible rough. Second anal spine equal to third, about 3 in head. Back and sides everywhere with clusters of black dots. San Francisco to San Diego; not rare. *miniatus.*[‡]

qq. Supraocular spine wanting. A. III, 6. Olivaceous, marbled with darker. Head 3; depth 2⅘. D. XIII–14; lat. l. 52. Maxillary extending beyond posterior border of pupil, 2 in head; lower jaw somewhat projecting. Eye 3½ in head. Interorbital space but little convex. Scales large; mandible with a few smooth scales. Tympanic spine usually absent; anal spines graduated, the second 2½ in head. San Diego to San Francisco, abundant. *atrovirens.*[§]

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[*] *Sebastichthys proriger* Jordan & Gilbert, Proc. U. S. Nat. Mus., 327, 1880.

[†] *Sebastodes rosaceus* Ayres, Proc. Cal. Acad. Sci., ii, 216, fig. 62, 1862, not *Sebastes rosaceus* Grd.; *Sebastosomus pinniger* Gill, Proc. Acad. Nat. Sci. Phila., 147, 1864.

[‡] *Sebastichthys miniatus* Jorban & Gilbert, Proc. U. S. Nat. Mus., 70, 1880.

[§] *Sebastichthys atrovirens* Jordan & Gilbert, Proc. U. S. Nat. Mus., 289, 1880.

aa. Interorbital space flat or slightly concave, of medium width, mesethmoid processes but little or not at all elevated, ventral process of basisphenoid rudimentary. Cranial ridges and spines moderately strong. Lower jaw usually not much, sometimes not at all, projecting; gill-rakers usually long and slender; A. III, 6, to III, 8. Deep water fishes.

s. Base of skull strongly curved, supraocular spine absent.

t. Parietal bones not meeting. Olivaceous above, silvery below. Head 2⅖ to 2⅜; D. XIII–12 or 13; A. III, 7; lat. l. 45 (pores). Maxillary nearly reaching posterior margin of pupil, 2¼ in head; lower jaw somewhat projecting, with a conspicuous knob. Scales rough-ctenoid, present on maxillary, mandible and snout. Second anal spine longer and stronger than third, 2 to 2⅓ in head. Peritoneum black. Santa Barbara Islands. *saxicola.**

tt. Parietal bones meeting. Uniform rose-red above, bright silvery below. Head 2½; depth 2¾. D. XIII–12 or 13; A. III, 7; lat. l. 35 (tubes). Maxillary reaching beyond middle of pupil, 2⅖ in head; premaxillaries with prominent dentigerous knobs, between which the tip of lower jaw fits. Eye 3 to 3½ in head; interorbital space 1⅔ in orbit. Scales large, minutely spinous, readily deciduous; very small and cycloid on maxillary, mandible and breast. Second anal spine longer and stronger than third, 2½ to 3 in head. Peritoneum jet black. Coronado Islands. *diploproa.*†

ss. Base of skull nearly straight; supraocular spine present, quite strong. Coronal and nuchal spines usually present (except in *melanostomus*).

u. Second anal spine much longer and stronger than third, 2½ in head. A. III, 6; head 2½; depth 2¾. D. XIII–13 or 14; lat. l. 29 (pores). Maxillary nearly reaching posterior margin of orbit, 2¼ in head; mandible included. Eye large, 3⅓ in head, much longer than snout or interorbital space. Scales everywhere very rough-ctenoid, covering branchiostegal rays, mandible and maxillary. Uniform red, light below. Peritoneum black. Santa Barbara Islands. *aurora.*‡

uu. Second anal spine little or not at all longer than third. A. III, 7.

v. Lower jaw projecting; longest dorsal spine 3¼ or more in head; mouth and gill cavities black.

w. Anal spines graduated. Head 3¼ in total length; depth about 3. D. XIII–13½; A. III, 7½; lat. l. 43. Body short, deep. Maxillary reaching posterior border of pupil; lower jaw projecting. Orbit one in snout, 3⅚ in head. Cranial spines covered with skin. Coronal spines absent. Scales very large, but few accessory scales. Body scarlet, dark above; mouth and gill-cavity black. Peritoneum black. San Diego. *melanostomus.*[*]

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* *Sebastichthys saxicola* Gilbert, Proc. U. S. Nat. Mus., 78, 1890.

† *Sebastichthys diploproa* Gilbert, Proc. U. S. Nat. Mus., 79, 1890.

‡ *Sebastichthys aurora* Gilbert, Proc. U. S. Nat. Mus., 80, 1890.

ww. Second anal spine equal to third. Head 2½; depth 2⅘. D. XIII–13; A. III, 7; lat. l. 30 to 35 (pores); about 55 vertical series of scales. Maxillary nearly reaching posterior margin of pupil 2⅕ in head. Eye large, 3½ in head; interorbital width 5⅓ in head. Lower jaw projecting, with prominent symphyseal knob. Cranial spines quite strong. Scales large, everywhere strongly ctenoid; accessory scales numerous; highest dorsal 3¼ in head. Red; axils black; mouth and gill-cavities largely black. Peritoneum jet black. Santa Barbara Islands. *introniger.*[†]

vv. Lower jaw scarcely projecting. Longest dorsal spine 2¾ in head. Chiefly red; mouth and gill cavities and peritoneum dusky. D. XIII–14; A. III, 7. Nuchal and coronal spines present; maxillary reaching posterior border of eye, 1⅘ in head. Interorbital space a little less than eye. Both jaws covered with rough ctenoid scales; highest dorsal 2½ in head. Second anal spine scarcely longer than third. Yeso; Aleutian Islands. *matzubaræ.*[‡]

aaa. Base of skull straight, or nearly so; interorbital space as a rule concave and narrow; the cranial ridges and spines well developed. Mesethmoid processes directed upward; ventral process of basisphenoid well developed; skull comparatively thin. Gill-rakers usually short.

x. Supraocular spine present; interorbital space concave.

y. Cranial ridges broken and armed with accessory spines, and interorbital space nearly flat in adult (ridges smooth, interorbital space concave in young, as in *Sebastodes rosaceus*). Second anal spine scarcely longer than third. Head 3; depth 2⅔; D. XIII–14; A. III, 7; lat. l. about 50; maxillary reaching nearly posterior edge of eye, 2 in head; lower jaw a little projecting. Eye 4½ in head. Scales on head and body rough; accessory scales numerous, Color red, nearly plain. Peritoneum white. San Diego to Puget Sound; Alaska (Bean). *ruberrimus.*[§]

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[*] *Sebastodes melanostomus* Eigenmann & Eigenmann, Proc. Cal. Acad. Sci., 17, 1890.

[†] *Sebastichthys introniger* Gilbert, Proc. U. S. Nat. Mus., 81, 1890.

[‡] *Sebastes matzubaræ* Hilgendorf, Sitzber. Gesellschaft Naturforschender Freunde, Berlin, 170, 1880.

[§] *Sebastodes ruber* Jordan & Gilbert (not of Ayres), Synopsis of Fishes of North America, 665, 1883.

yy. Cranial ridges smooth; second anal spine much longer, usually stronger than third.

z. Color more or less rosy, with three to five round blotches of pink on sides of back.

A. Dorsal spines usually low, the highest less than half the length of head; no small green spots on sides of back.

B. Head and body everywhere with many small roundish pale spots. Head 2½; depth 2½. D. XIII–13; A. III, 6; lat. l. 53. Maxillary very broad, extending beyond pupil, 2 in head; lower jaw slightly projecting. Eye 4 in head. Scales strongly ctenoid, accessory scales numerous; head densely covered with small scales. Second anal spine considerably longer than third, 2¾ in head. Orange red, back olive-shaded. Peritoneum white. San Diego to San Francisco. *constellatus.*[*]

BB. Body without stellate spots.

C. Second anal spine longer than third.

D. The five large pink blotches washed with orange, general color light orange, overlaid with blackish. Head 2⅗; depth 2⅘. D. XIII–12; A. III, 6; lat. l. 40 (tubes). Maxillary reaching posterior margin of pupil, 2 in head; lower jaw scarcely projecting. Eye large, 4 in head; interorbital space rather broad. Scales moderate; many accessory scales; both jaws with small smoothish scales. Second anal spine 2½ in head. Santa Barbara. *umbrosus.*[†]

DD. Bright orange red; the pale blotches on sides surrounded by purple shades; head with purplish above. Head 2⅜; depth 3. D. XIII–13; A. III, 6; lat. l. 48. Maxillary not reaching posterior border of eye, 2 in head; jaws equal, eye very large, 3½ in head. Scales moderate; accessory scales numerous. Second anal spine much longer and stronger than third, 2⅛ in head, curved. Mandible naked. Peritoneum blackish. San Diego to San Francisco, abundant. *rosaceus.*[‡]

DDD. General color, bright clear rose-red; pale blotches on sides surrounded by green shades; no purple. Head 2½; depth 3. D. XIII–14; A. III, 6; lat. l. 58. Maxillary reaching beyond pupil, 2⅙ in head; jaws about equal. Cranial ridges very sharp;

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[*] *Sebastichthys constellatus* Jordan & Gilbert, Proc. U. S. Nat. Mus. 295, 1880.

[†] *Sebastichthys umbrosus* Jordan & Gilbert, Proc. U. S. Nat. Mus. 410, 1882; *Sebastodes areus* Eigenmann & Eigenmann, Proc. Cal. Acad. Sci. 20, 1890.

[‡] *Sebastes rosaceus* Girard, Proc. Acad. Nat. Sci. Phila. viii, 146, 1854; and in U. S. Pacific R. R. Surv. Fish. 78, plate 21 (poor figure).

eye very large, 3⅓ in head; accessory scales very numerous, mandible partly scaly; second anal spine very long, longer than maxillary, 2 in head. Peritoneum dusky. Off Monterey and San Francisco, rather rare. *rhodochloris.*[*]

DDDD. Body and head intense rose-pink, color marks washed or faded. Head 2½; depth 3. D. XIII–13½; A. III, 6½; lat. l. 37. Maxillary reaching beyond eye, 2 in head; lower jaw included, symphyseal knob strong. Eye one in snout, slightly more than 4 in head. Maxillary and mandible scaly; accessory scales numerous on cheeks and opercles. Second anal spine 2⅔ to 3 in head. Interorbital space flattish, with deep median groove. Peritoneum white or more or less dusky. San Diego. *eos.*[†]

CC. Second anal spine about as long as third. Head 3; depth 3. D. XIII–13½; A. III, 7½; lat. l. (pores) 44–45. Maxillary reaching posterior edge of pupil, 2 in head; lower jaw projecting, entering profile, without knob. Orbit one in snout, 4⅛ to 4½ in head, a little greater than interorbital width. Scales strongly ctenoid, accessory scales very numerous everywhere; mandible naked. Dorsal surface closely covered with small, bronze, roundish spots; ventral surface light geranium red. Peritoneum white, sparsely dotted with black. San Diego. *gillii.*[‡]

AA. Dorsal spines very high, the highest half the length of head. Body above with many small round green spots. Head 2½; depth 2¾. D. XIII–13; A. III, 6; lat. l. 50. Maxillary reaching to beyond pupil, 2½ in head; jaws equal, a conspicuous symphyseal knob. Eye 3½ in head. Mandible naked. Second anal spine much longer and stronger than third, 2¼ in head. Olivaceous above, sides pinkish or golden; the pink spots less distinct than in *Sebastodes rosaceus.* San Diego to San Francisco, abundant. *chlorostictus.*[§]

zz. Color nearly as in *Sebastodes zacentrus:* no round pink blotches on sides of back. Head 2½; depth 2⅚ to 3. D. XIII–13; A. III, 7; lat. l. 31 (pores), about 60 vertical series of scales above lateral line. Maxillary reaching beyond middle of pupil, 2¼ in head; jaws equal. Eye 2⅘ in head, longer than snout or interorbital space. Nuchal spines present. Scales rough-ctenoid; those on maxillary and mandible minute and smooth. Second anal spine longer and stronger than third, 2⅔ in head. Peritoneum black. Santa Barbara Islands. *rupestris.*[‖]

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[*] *Sebastichthys rhodochloris* Jordan & Gilbert, Proc. U. S. Nat. Mus. 144, 1880.

[†] *Sebastodes eos* Eigenmann & Eigenmann, Proc. Cal. Acad. Sci. 18, 1890.

[‡] *Sebastodes gillii* Eigenmann & Eigenmann, Amer. Naturalist, 154, 1891.

[§] *Sebastichthys chlorostictus* Jordan & Gilbert, Proc. U. S. Nat. Mus. 294, 1880.

[‖] *Sebastichthys rupestris* Gilbert, Proc. U. S. Nat. Mus. 76, 1890.

xx. Supraocular spine wanting.

E. Mandible scaly, peritoneum dusky or black.

F. Lower jaw only slightly or not all projecting; peritoneum jet-black.

G. Head $2\frac{1}{2}$; depth 3. D. XIII–12; A. III, 5; lat. l. (tubes) 40–45. Body short deep. Maxillary reaching beyond pupil, $2\frac{1}{5}$ in head; jaws about equal. Eye very large, $2\frac{3}{4}$ to 3 in head; interorbital space 6 in head. Scales small, mostly smooth and cycloid, irregular. Mandible and maxillary partly scaled. Second anal spine longer and stronger than third, 2 in head. Pale below, dusky above, blotched with reddish and black; mouth and gill cavities and peritoneum jet-black. Gulf of California. *sinensis.*[*]

GG. Head $2\frac{4}{5}$; depth $3\frac{1}{3}$. D. XIII–14 or 15; A. III, 7 or 8; lat. l. (tubes) about 42, 70 vertical series of scales above lat. l. Maxillary reaching middle of pupil, $2\frac{1}{3}$ in head; lower jaw slightly the longer, with small knob. Eye much longer than snout, 3 to $3\frac{1}{4}$ in head; interorbital space $1\frac{2}{3}$ in orbit. Scales large, rough-ctenoid, those on maxillary and mandible smoother. Second anal spine usually longer and stronger than third, $1\frac{1}{2}$ to $1\frac{4}{5}$ in head. Five vaguely defined black bars on back; some red on the sides. Roof of mouth posteriorly dusky; mouth and branchial cavities otherwise white. Peritoneum jet-black. Santa Barbara Islands. *zacentrus.*[†]

FF. Lower jaw strongly projecting. Peritoneum dusky. Head $2\frac{3}{5}$; depth $3\frac{1}{3}$. D. XIII–13; A. III, 6; lat. l. 58. Maxillary reaching posterior margin of pupil, $2\frac{1}{4}$ in head. Eye very large, longer than snout, $3\frac{1}{3}$ in head. Scales large, not very rough; accessory scales numerous; maxillary and mandible scaly. Second anal spine much longer than third, 2 in head. Light red; sides above with irregular horizontal, interrupted olive-green bands. San Diego to San Francisco, abundant. *elongatus.*[‡]

EE. Mandible naked, peritoneum pale or white. Body usually deep.

H. Scales on head mostly cycloid; lower jaw projecting; head large, pointed.

I. Pink, with 4 interrupted cross-bars of black; back sometimes dusky. Head $2\frac{3}{4}$; depth 3. D. XIII–$13\frac{1}{2}$; A. III, $7\frac{1}{2}$; lat. l. 50. Head very large; maxillary reaching posterior margin of pupil, greatly dilated behind, its width about equal to diameter of eye; lower jaw projecting, with a well developed symphyseal knob.

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[*] *Sebastichthys sinensis* Gilbert, Proc. U. S. Nat. Mus. 81, 1890.

[†] *Sebastichthys zacentrus* Gilbert, Proc. U. S. Nat. Mus. 77, 1890.

[‡] *Sebastes elongatus* Ayres, Proc. Cal. Acad. Sci. ii, 26, 1859, fig. 9.

Eye 5½ in head, one in interorbital space. Scales of body weakly ctenoid; those on head cycloid; accessory scales numerous; mandible and maxillary naked. Second anal spine 4½ in head. Peritoneum white. San Diego to Monterey. *levis.*[*]

II. Pinkish white, banded with deep crimson. Head 2½; depth 2⅓. D. XIII–12; A. III, 7; lat. l. 55. Maxillary broad, reaching middle of eye, 2¼ in head; lower jaw projecting. Eye very large, 3¾ in head. Scales of body rather smooth; those of head thin, mostly cycloid; accessory scales very numerous; mandible naked; maxillary with a few scales. Second anal spine much longer and stronger than third, 2½ in head. Peritoneum white. San Diego to Monterey, rare. *rubrivinctus.*[†]

HH. Scales on head ctenoid; lower jaw usually included. Second anal spine little enlarged.

J. Nuchal spines usually present, sometimes coalescent with the parietals. Head 3; depth 2½. D. XIII–13; A. III, 5; lat. l. 50. Maxillary reaching middle of eye, 2⅓ in head; jaws equal. Eye small, 5 in head. Interorbital space closely scaled; jaws naked. Second anal spine scarcely longer than third, 2⅓ in head. Dark olive, blackish above, yellowish below; sides with about 7 oblique black cross-bands. Peritoneum pale. San Francisco to Cerros Island. *serriceps.*[‡]

JJ. Nuchal spines none. Interorbital space widening markedly from before backward.

K. Coronal spines usually present. Head 3⅕; depth, 2½. D. XIII–13; A. III, 7; lat. l. 45. Maxillary reaching beyond eye, 2⅓ in head; jaws nearly equal. Scales on body large, ctenoid; accessory scales not numerous; mandible naked. Second anal spine longer and stronger than third, 2⅓ in head. Blackish brown, mottled with light brown. Cerros Island to Vancouver's Island; very abundant. *auriculatus.*[*]

KK. Coronal spines none.

L. Cranial ridges with entire edges.

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[*] *Sebastichthys levis* Eigenmann & Eigenmann, Notes from San Diego Biol. Lab. i, 6, 1889; West American Scientist, 129, 1889.

[†] *Sebastichthys rubrivinctus* Jordan & Gilbert, Proc. U. S. Nat. Mus. 291, 1880.

[‡] *Sebastichthys serriceps* Jordan & Gilbert, Proc. U. S. Nat. Mus. 38, 1880.

[§] *Sebastes auriculatus* Girard, Proc. Acad. Nat. Sci. Phila. 131, 146, 1854, and U. S. Pac. R. R. Surv. Fish, 80; *Pteropodus dallii* Eigenmann & Beeson, Amer. Naturalist, 66, 1894. This last is probably a young *Sebastodes auriculatus* with coronal spines obsolete.

M. Head 3; depth 2¾. D. XIII–13; A. III, 6; lat. l. 47. Maxillary reaching posterior margin of eye, 2⅕ in head; jaws equal, no symphyseal knob. Eye small, anterior, 4½ in head; scales on body large; accessory scales few. Gill-rakers extremely short, most of them as wide as high. Second anal as long as third, 3 in head. Dusky green, with paler mottlings. Peritoneum brownish. San Diego to Humboldt Bay; abundant southward. *rastrelliger*.[*]

N. Highest dorsal spine notably more than half length of head.

O. Head and upper parts not speckled with orange; membrane of spinous dorsal not very deeply incised.

P. Color dark brown, varied with light brown; armature of head, fin-rays, gill-rakers and scales as in *Sebastodes vexillaris;* but the lower jaw is more projecting, the pale shades are better defined, and the dorsal spines are slender and much lower than in *Sebastodes vexillaris.* Puget Sound to Sitka; abundant. *caurinus*.[†]

PP. Reddish, varied with yellowish. D. XIII–16; A. III, 6; lat. l. 55. Maxillary extending behind orbit, 2 in head; lower jaw a little projecting, without knob. Eye high up, 4–4½ in head. Jaws naked. Dorsal spines higher than in *Sebastodes caurinus*. Second anal scarcely longer than third, 3 in head. Peritoneum white. San Diego and northward. *vexillaris*.[‡]

OO. Head and upper parts everywhere speckled with orange. Dorsal spines extremely high, their membranes deeply incised. Head 2⅗; depth 2¼. D. XIII–13; A. III, 6; lat. l. 47. Maxillary reaching posterior margin of eye, about 2 in head; jaws nearly equal. Scales rough, jaws naked. Second anal spine little higher than third, 2⅓ in head; front of back yellowish; soft fins black. Peritoneum pale. Monterey to Sitka, very abundant northward. *maliger*.[§]

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[*] *Sebastichthys rastrelliger* Jordan & Gilbert, Proc. U. S. Nat. Mus. 296, 1880.

[†] *Sebastes caurinus* Richardson, Voy. Sulphur, Ichth. 77, pl. 41, fig. 1, 1845.

[‡] *Sebastichthys vexillaris* Jordan & Gilbert, Proc. U. S. Nat. Mus. 292, 1880.

[§] *Sebastichthys maliger* Jordan & Gilbert, Proc. U. S. Nat. Mus., 322, 1880.

NN. Highest dorsal spine little if any more than half the length of head.

Q. Pale blotches on sides not forming a continuous lateral band; parietal ridges moderate.

R. Pale markings flesh color, dark markings olivaceous. Head $2\frac{2}{3}$, depth $2\frac{3}{5}$. D. XIII–13; A. III; 6; lat. l. 43. Maxillary extending a little beyond posterior margin of eye, 2 in head; jaws about equal, no symphyseal knob, scales on head rougher than in *Sebastodes chrysomelas*, mandible and maxillary naked. Second anal spine slightly longer than third, $2\frac{3}{4}$ in head. Peritoneum white. San Diego to San Francisco, abundant. *carnatus.*[*]

RR. Pale markings yellow, dark markings blackish; pattern of coloration exactly as in *Sebastodes carnatus.* Head $2\frac{3}{4}$; depth $2\frac{3}{4}$. D. XIII–13; A. III, 6; lat. l. 45. Maxillary reaching posterior margin of eye, 2 in head; lower jaw slightly included. Scales moderate, rough; accessory scales few; mandible, maxillary and nasal region naked. Second anal strong, equal to third, $2\frac{3}{4}$ in head. Peritoneum pale. San Diego to San Francisco; abundant. *chrysomelas.*[†]

QQ. Pale blotches on sides forming a continuous lateral band. Head 3; depth $2\frac{3}{4}$; D. XIII–13; A. III, 7, lat. l. 49. Maxillary extending beyond pupil, 2 in head; jaws equal. Eye large. Scales rough, accessory scales numerous; jaws naked. Second anal spine slightly longer than third, $2\frac{1}{2}$ in head; parietal ridges very strong. Ground color blue black. Body and fins profusely speckled with pale; pale markings yellow. Peritoneum pale. Vancouver's Island to Port Harford, abundant. *nebulosus.*[‡]

LL. Cranial ridges with the surface broken, spinous. Head $2\frac{4}{5}$; depth $2\frac{2}{3}$. D. XIII–15, A. III, 7; lat. l. 50. Maxillary reaching beyond pupil, 2 in head; lower jaw very slightly projecting. Eye large, $4\frac{1}{4}$ in head. Scales rough; jaws naked. Second anal spine longer and much stronger than third, 2½ in head. Frontal ridges elevated. Bright red, with black bands. Peritoneum white. Monterey to Vancouver's Island, rare southward. *nigrocinctus*.[*]

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[*] *Sebastichthys carnatus* Jordan & Gilbert, Proc. U. S. Nat. Mus., 73, 1880.

[†] *Sebastichthys chrysomelas* Jordan & Gilbert, Proc. U. S. Nat. Mus., 455, 465, 1880.

[‡] *Sebastes fasciatus* Girard, Proc. Acad. Nat. Sci. Phila., 146, 1854, etc. (not of Storer); *Sebastes nebulosus* Ayres, Proc. Cal. Acad. Sci., i, 5, 1854.

Appendix.

For convenience of reference, I add in full the article by Eigenmann & Beeson, including their proposed rearrangement of the group based on a study of its cranial characters.

PRELIMINARY NOTE ON THE RELATIONSHIP OF THE SPECIES USUALLY UNITED UNDER THE GENERIC NAME SEBASTODES.

(Eigenmann & Beeson, American Naturalist, 668-671, July, 1893.)

On the Pacific coast of temperate North America, a large number of species of viviparous Scorpænidæ are found. They range all the way from tide water to a depth of 1600 feet, from Cerros Island to Alaska. They are most abundant on the coast of California, about 30 species being known from San Diego, and a like number from Monterey. In size they vary from 1 lb. to 30 lbs.

The species have been variously grouped as forming one genus by Jordan & Gilbert, as forming two by Jordan, and as forming four by Gill. Jordan & Gilbert, in their Synopsis, arranged the species known to them according to the greater or less prominence of the spiniferous ridges of the skull. In examining the skulls of a number of them, one of us, several years ago, noticed that in a number of species the parietals meet over the supra-occipitals, while in others they are separated, and the supra-occipital is exposed above for its whole length.

A more recent examination of a larger series of skulls, tended to show that, if we admit the relationships pointed out by Jordan & Gilbert, this greater or less development of the parietals is of no significance. A more thorough study has, however, convinced us that the species with united parietals are related, and that the relationships pointed out by Jordan & Gilbert are at fault.

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[*] *Sebastes nigrocinctus* Ayres, Proc. Cal. Acad. Sci., ii, 25 and 217, fig. 6, 1859.

The value placed on such a cranial character as the union or nonunion of the parietals need not be defended here. It may only be mentioned that in *mystinus*, which for other reasons we considered the hub to which the other groups proposed here are related as spokes, the parietals are united in 8 out of 10 specimens. The variation of this character in *mystinus* but confirmed our view that it is the radiating point.

Leaving the parietals, the next prominent characters are the development or nondevelopment of certain cranial spines and ridges. These spines are found in all stages, from minute points to comparatively huge spines. The variation in size for this reason, if there were no other objections, cannot be utilized for determining generic relationship. The spines are very regularly arranged, and in any given species certain ones are always present. (Individual variations should of course be expected in this character, as in every other, if a sufficient number of specimens are examined.) The *constancy* of the presence of certain spines in a given species warrants the use of the presence or absence of these spines in the different species in determining their true relationship. This relationship is usually borne out by a number of subsidiary characters. Considering the constancy of the spines, reinforced by subsidiary characters, we have divided the species usually united under the generic name *Sebastodes* as follows:

a. Parietals meeting above the supra-occipital.
  b. Jaws equal; head narrow above; high and prominent cranial ridges ending in spines; preocular, supraocular, tympanic and parietals present. Scales usually very strongly ctenoid; accessory scales

numerous; suborbital stay directed obliquely downward and backward; second anal spine much heavier than, and at least as long as the third; body short and deep, back arched; mouth very large; head heavy. All known species with cross bands.

SEBASTICHTHYS Gill.

*nigrocinctus, serriceps, rubrivinctus, diploproa.**

bb. Lower jaw much projecting; head broad, the skull usually convex; cranial ridges, when present, low; gill-rakers very long and slender; scales usually smooth, few if any accessory scales. Suborbital stay little if at all oblique.

c. Parietal ridges ending in spines; preocular, supraocular and tympanic spines well developed. Peritoneum black.

d. Postocular spine present. Second anal spine usually stronger and longer than third. Symphyseal knob strong, projecting forward. Dorsal low. (Peritoneum black, mandibles and maxillary scaled.)

ACUTOMENTUM[1] E. & B.

[1] Type *A. ovalis* (Ayres).

*melanostomus, ovalis, rufus, *alutus, macdonaldi* n. sp. nov.= *S. proriger* E. & E., not of J. & G.

dd. Postocular spine not developed.

We have not been able to examine the two species (entomelas and atrovirens) and cannot vouch for their position.

cc. Parietal ridges not ending in spines.

e. Preocular spines well developed. Supraocular and tympanic spines sometimes present. Interorbital wide, convex. Peritoneum black. Approximated edges of sub-opercle and inter-opercle frequently ending in spines. PRIMOSPINA[2] E. & B.

[2] Type *P. Mystinus* (J. & G.)

The only species *(mystinus)* is the most variable species of the group.

ee. Preocular without spine, skull smooth, without spines. Peritoneum usually white.

SEBASTOSOMUS Gill.

*flavidus, serranoides, melanops, *ciliatus.*

aa. Parietals separated by the supra-occipital.

f. Cranium with parietal ridges only. Lower jaw much projecting, entering the profile; a prominent symphyseal knob directed forward. Head broad, convex. Interobital convex, nearly smooth.

SEBASTODES Gill.

paucispinis, goodei.

* Species marked with an asterisk have not been examined in reference to the characters utilized.

ff. Cranium with many ridges, all ending in spines.

g. Postocular and tympanic spines both present. Interopercle and subopercle without spines. Lower pectoral rays normal.

h. Coronal spines; nuchal spines, a spine below, another in front of eye. * *matzubarae* with this species we are not acquainted.

hh. No coronal spines. SEBASTOMUS Gill.

*miniatus, pinniger, levis, aereus**, *constellatus, umbrosus**, *rosaceus, rhodochloris**, *gilli**, *rupestris**, *eos, chlorostictus**, *ruber**, *rufus.*

gg. Postocular spine wanting.

i. Coronal spines none.

PTEROPODUS E. & B.[1]

Species with normal pectoral rays, (living off the bottom) *saxicola**, *proriger*†*, *brevispinis**, *elongatus, sinensis.*

Species with lower pectoral rays thick (living on the bottom) *zacentrus**, *maliger, caurinus, vexillaris, rastrelliger, nebulosus, carnatus, chrysomelas.*

ii. Coronal spines present.

AUCTOSPINA E. & B.[2]

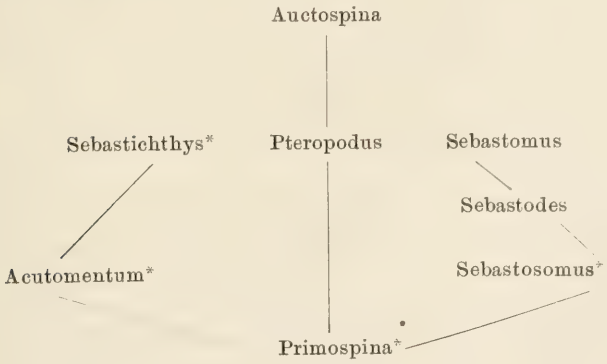
*aurora**, *auriculatus.*

† The specimen described by E. & E., Proc. Cal. Acad. Sci. (2) III, 15, 1890, is a species distinct from *proriger*.

The inter-relationship of these genera is complex. It may be represented by the following diagram, where the genera with the united parietals are followed by an asterisk.

[1] Type *P. maliger* (J. & G.)

[2] Type *A. auriculatus* (Girard).



EXPLANATION OF PLATES.

PLATE LVII.

1. Sebastodes paucispinis $\times 1\frac{1}{6}$; Monterey, Cal. No. 1461, Mus. L. S. Jr. Univ.
2. Sebastodes goodei $\times 1\frac{1}{5}$; Monterey, Cal. No. 1462, Mus. L. S. Jr. Univ.
3. Sebastodes flavidus $\times 1\frac{1}{9}$; Monterey, Cal. No. 1471, Mus. L. S. Jr. Univ.

PLATE LVIII.

4. Sebastodes melanops $\times 1$; San Francisco market. No. 1466, Mus. L. S. Jr. Univ.
5. Sebastodes entomelas $\times 2\frac{1}{3}$; San Francisco market. No. 1472, Mus. L. S. Jr. Univ.
6. Sebastodes ovalis $\times 2\frac{1}{3}$; San Francisco market, No. 1474, Mus. L. S. Jr. Univ.

PLATE LIX.

7. Sebastodes pinniger $\times 1$; Monterey, Cal. No. 1469, Mus. L. S. Jr. Univ.
8. Sebastodes miniatus $\times \frac{5}{6}$; Cortez Banks, Cal. No. 1467, Mus. L. S. Jr. Univ.
9. Sebastodes miniatus $\times 2\frac{2}{9}$; San Francisco market. No. 1468, Mus. L. S. Jr. Univ.

PLATE LX.

10. Sebastodes atrovirens $\times 1\frac{1}{3}$; San Francisco market. No. 1493, Mus. L. S. Jr. Univ.
11. Sebastodes sp. incog. $\times 1\frac{1}{3}$; North Pacific. No. 1473, Mus. L. S. Jr. Univ.
12. Sebastodes saxicola $\times 2$; Santa Barbara Channel. No. 1477, Mus. L. S. Jr. Univ.

PLATE LXI.

13. Sebastodes diploproa $\times 1\frac{1}{6}$; Santa Barbara Channel. No. 1476, Mus. L. S. Jr. Univ.
14. Sebastodes introniger $\times 1$; North Pacific. No. 1479, Mus. L. S. Jr. Univ.
15. Sebastodes aurora $\times 1\frac{1}{2}$; Santa Barbara Channel. No. 1478, Mus. L. S. Jr. Univ.

PLATE LXII.

16. Sebastodes ruberrimus $\times 2\frac{2}{5}$; Monterey, Cal. No. 1484, Mus. L. S. Jr. Univ.
17. Sebastodes ruberrimus $\times 1\frac{3}{5}$; San Francisco market. No. 1483, Mus. L. S. Jr. Univ.
18. Sebastodes ruberrimus $\times 1\frac{1}{4}$; Monterey, Cal. No. 1482, Mus. L. S. Jr. Univ.

PLATE LXIII.

19. Sebastodes ruberrimus $\times \frac{2}{3}$; San Francisco market. No. 1481, Mus. L. S. Jr. Univ.
20. Sebastodes rosaceus $\times 2\frac{2}{3}$; Monterey, Cal. No. 1485, Mus. L. S. Jr. Univ.
21. Sebastodes chlorostictus $\times 1\frac{1}{3}$; Monterey, Cal. No. 1487, Mus. L. S. Jr. Univ.

PLATE LXIV.

22. Sebastodes elongatus $\times 2$; Monterey, Cal. No. 1490, Mus. L. S. Jr. Univ.
23. Sebastodes rubrivinctus $\times 1\frac{1}{6}$; Monterey, Cal. No. 1491, Mus. L. S. Jr. Univ.
24. Sebastodes levis $\times \frac{2}{3}$; Monterey, Cal. No. 1492, Mus. L. S. Jr. Univ.

PLATE LXV.

25. Sebastodes serriceps $\times 1\frac{1}{3}$; San Pedro, Cal. No. 1501, Mus. L. S. Jr. Univ.
26. Sebastodes auriculatus $\times 1\frac{3}{5}$; Monterey, Cal. No. 1500, Mus. L. S. Jr. Univ.
27. Sebastodes rastrelliger $\times 1\frac{1}{3}$; Monterey, Cal. No. 1494, Mus. L. S. Jr. Univ.

PLATE LXVI.

28. Sebastodes vexillaris; Monterey, Cal. No. 1502, Mus. L. S. Jr. Univ.
29. Sebastodes vexillaris $\times 1$, San Francisco market. No. 1503, Mus. L. S. Jr. Univ.
30. Sebastodes maliger $\times 2\frac{1}{3}$; San Francisco market. No. 1498, Mus. L. S. Jr. Univ.

PLATE LXVII.

31. Sebastodes maliger $\times 1\frac{1}{2}$; Monterey, Cal. No. 1497, Mus. L. S. Jr. Univ.
32. Sebastodes nebulosus $\times 1\frac{3}{4}$; Monterey, Cal. No. 1499, Mus. L. S. Jr. Univ.
33. Sebastodes paucispinis $\times 1\frac{1}{5}$; Monterey, Cal. No. 1461, Mus. L. S. Jr. Univ.

PLATE LXVIII.

34. Sebastodes flavidus $\times 1\frac{1}{9}$; Monterey, Cal. No. 1471, Mus. L. S. Jr. Univ.
35. Sebastodes miniatus $\times \frac{7}{9}$; Cortez Banks, Cal. No. 1467, Mus. L. S. Jr. Univ.
36. Sebastodes atrovirens $\times 1\frac{1}{2}$; San Francisco market. No. 1493, Mus. L. S. Jr. Univ.

PLATE LXIX.

37. Sebastodes saxicola × $2\frac{1}{3}$; Santa Barbara Channel. No. 1477, Mus. L. S. Jr. Univ.

38. Sebastodes ruberrimus × 1; Monterey, Cal. No. 1482, Mus. L. S. Jr. Univ.

39. Sebastodes chlorostictus × $1\frac{1}{6}$; Monterey, Cal. No. 1487, Mus. L. S. Jr. Univ.

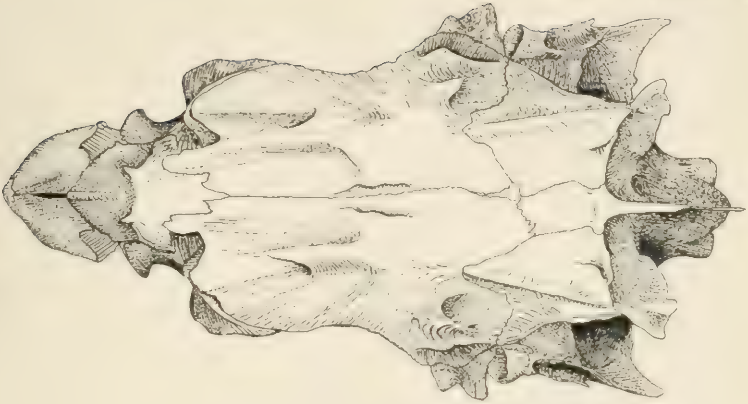
PLATE LXX.

40. Sebastodes elongatus × $1\frac{2}{3}$; Monterey, Cal. No. 1490, Mus. L. S. Jr. Univ.

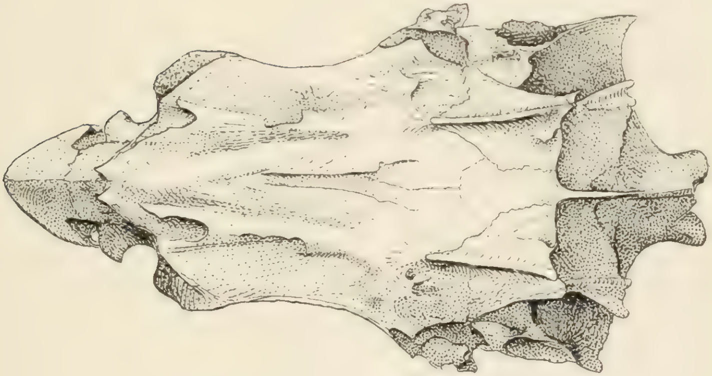
41. Sebastodes rastrelliger × $1\frac{1}{2}$; Monterey, Cal. No. 1494, Mus. L. S. Jr. Univ.

42. Sebastodes nebulosus × 2; Monterey, Cal. No. 1499, Mus. L. S. Jr. Univ.

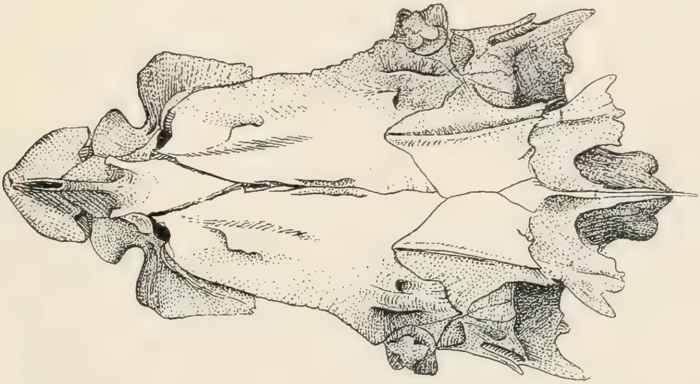
PLATE [illegible]



1. SEBASTODES PAUCISPINIS

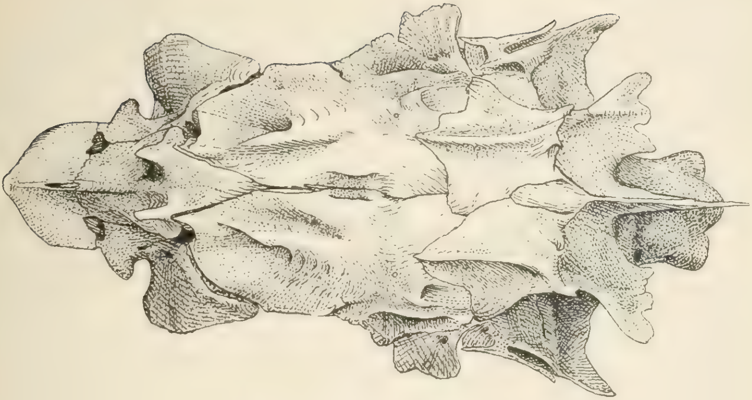


2. SEBASTODES GOODEI

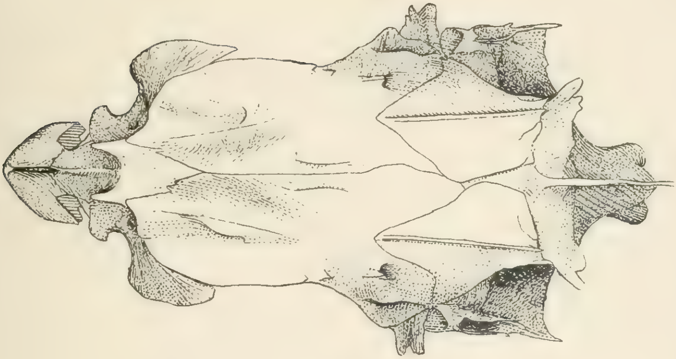


3. SEBASTODES FLAVIDUS

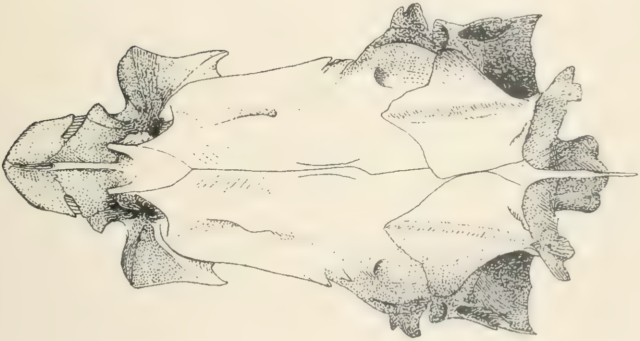
BROWN, DEL LITh. BRITTON &



4. SEBASTODES MELANOPS



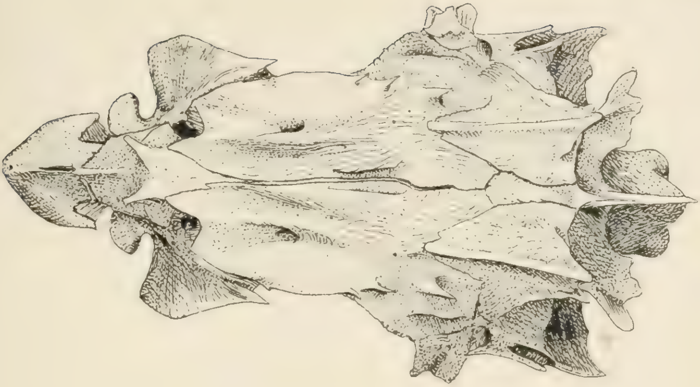
5. SEBASTODES ENTOMELAS



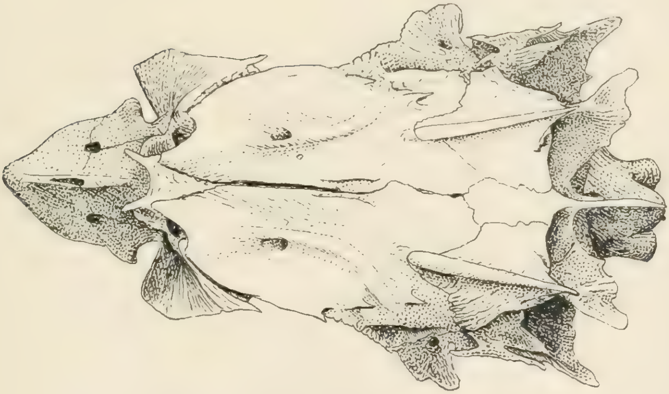
Brown, Del.

6. SEBASTODES OVALIS

PLATE [illegible]



7. SEBASTODES PINNIGER



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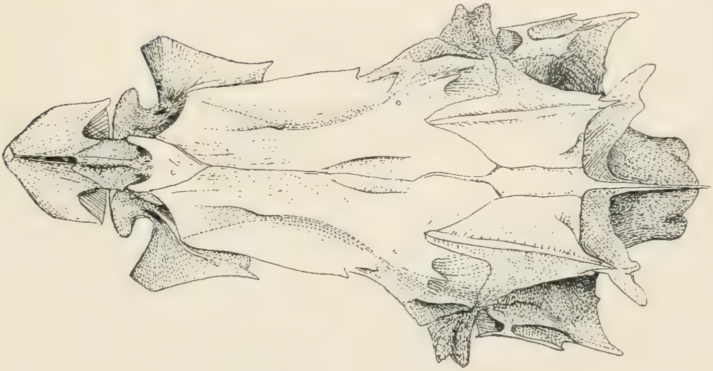

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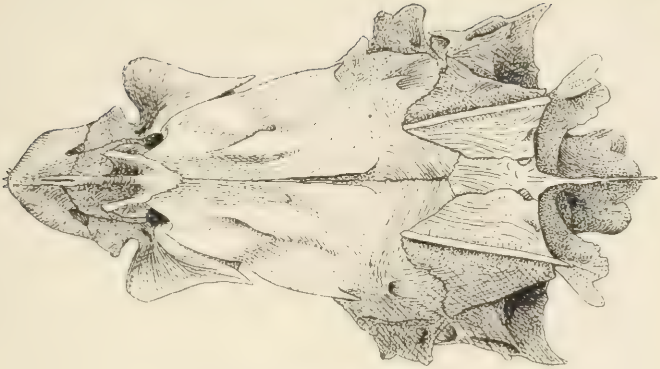

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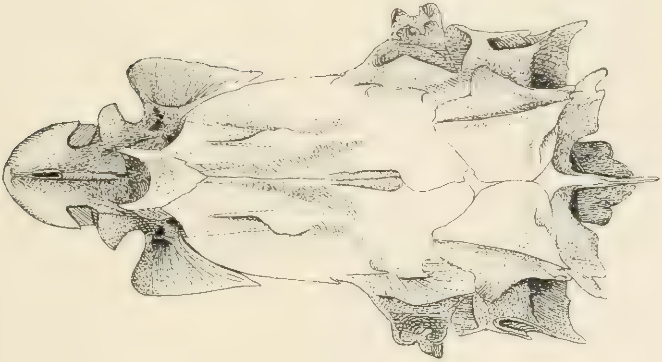

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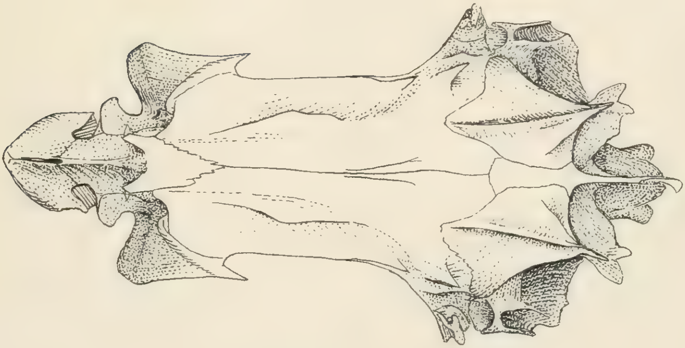

12. SEBASTODES SAXICOLA

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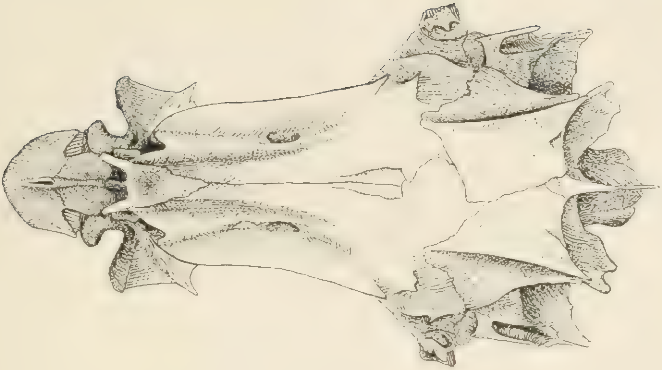

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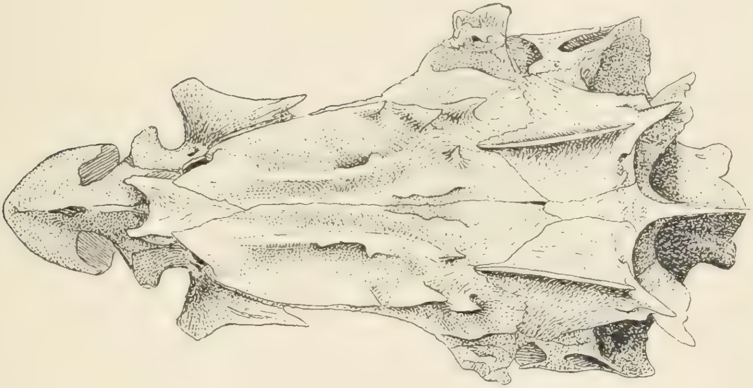

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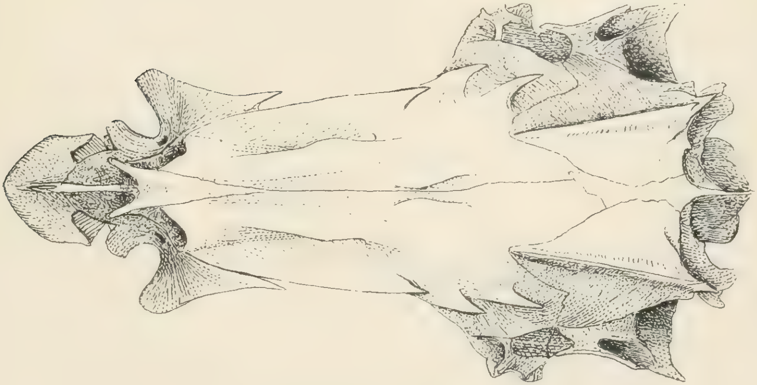

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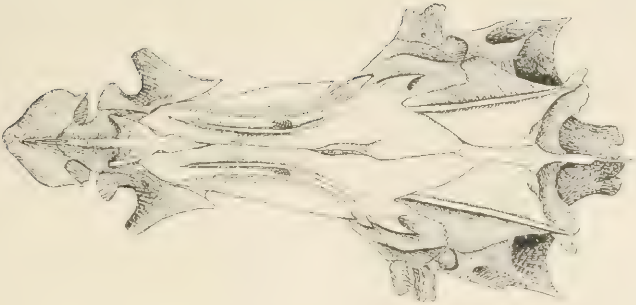

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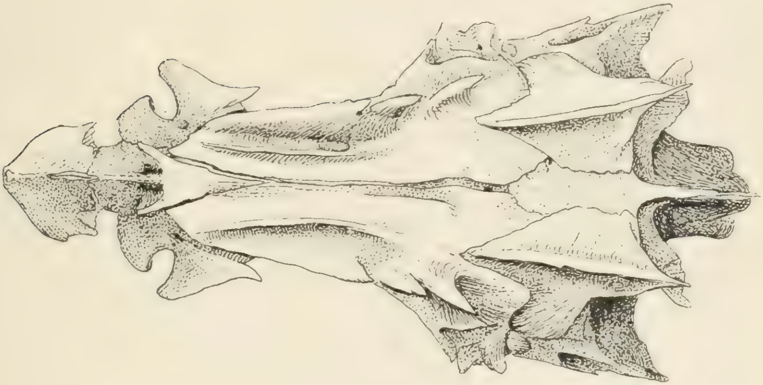

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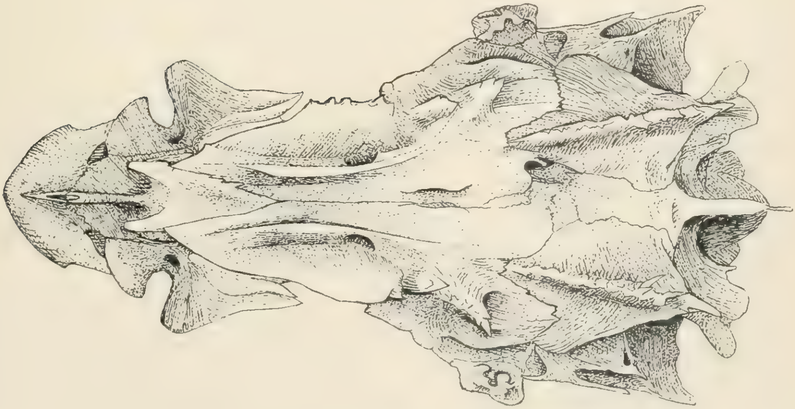

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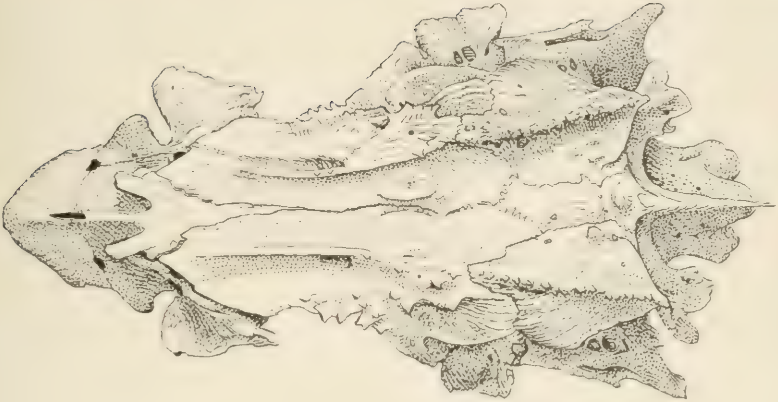

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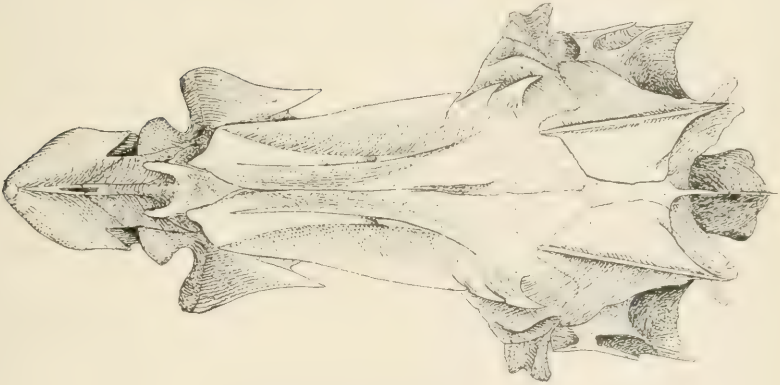

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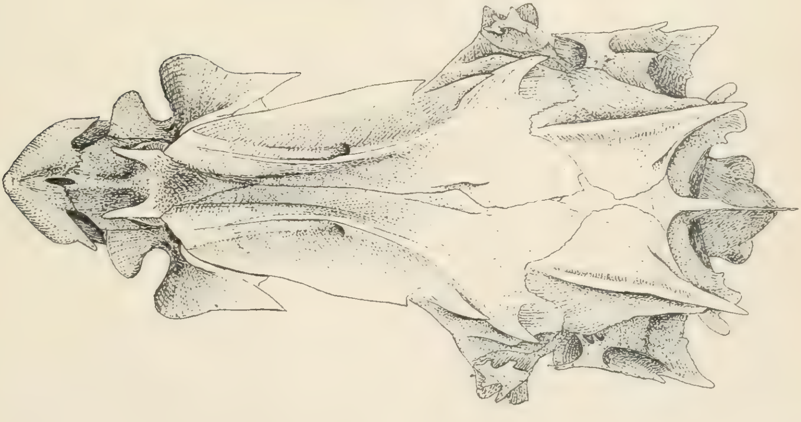

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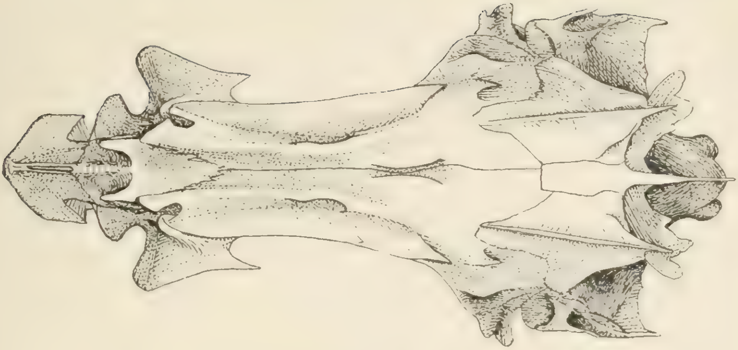

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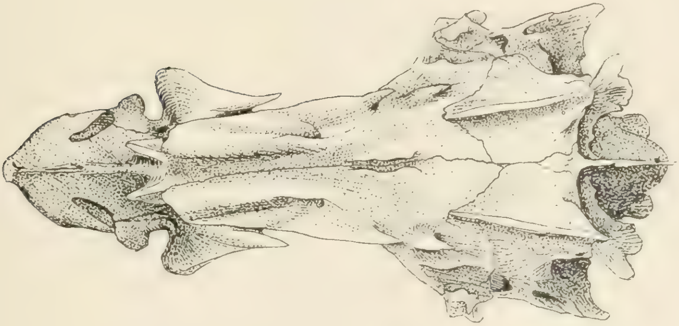

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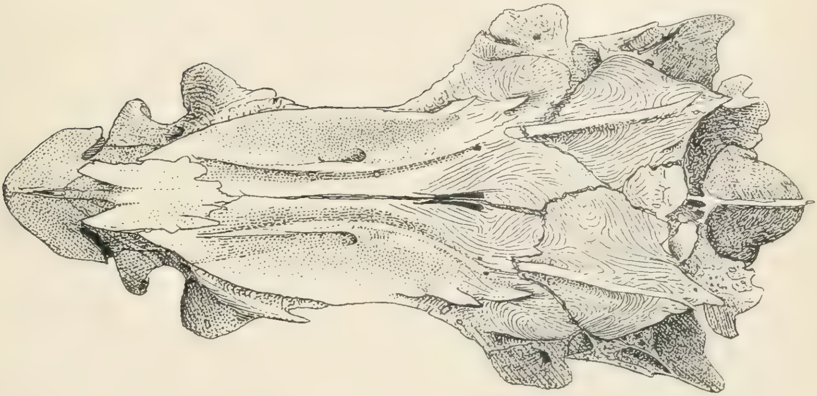
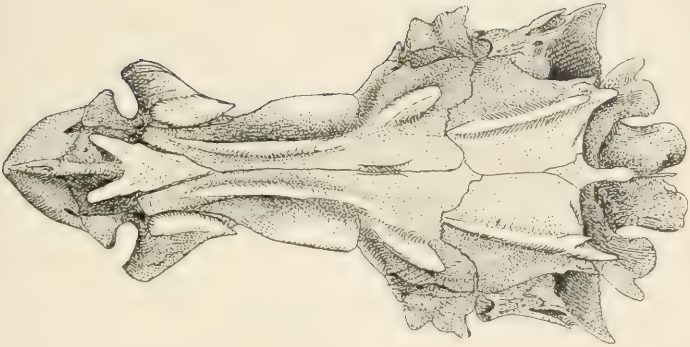


24. SEBASTODES LEVIS

Brown, Del

PLATE X



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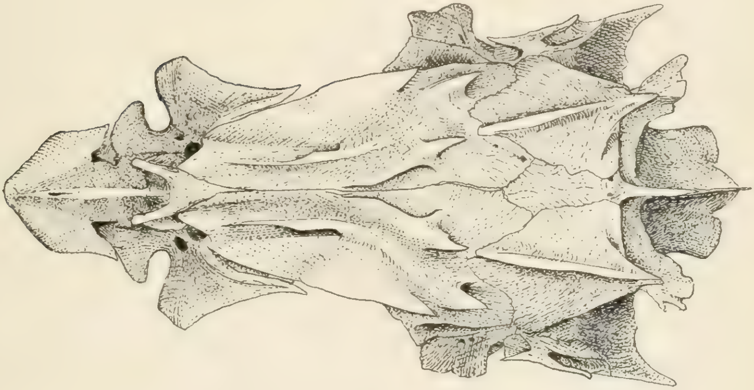

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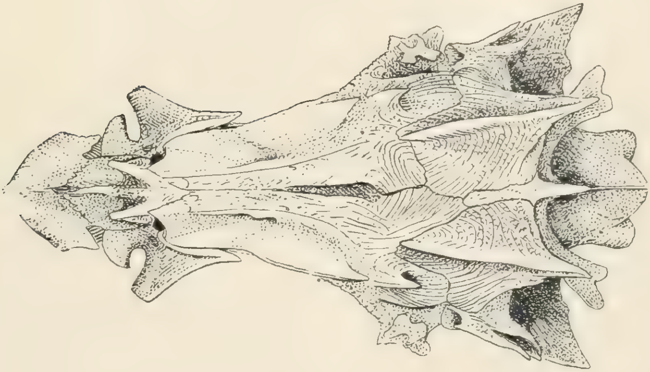
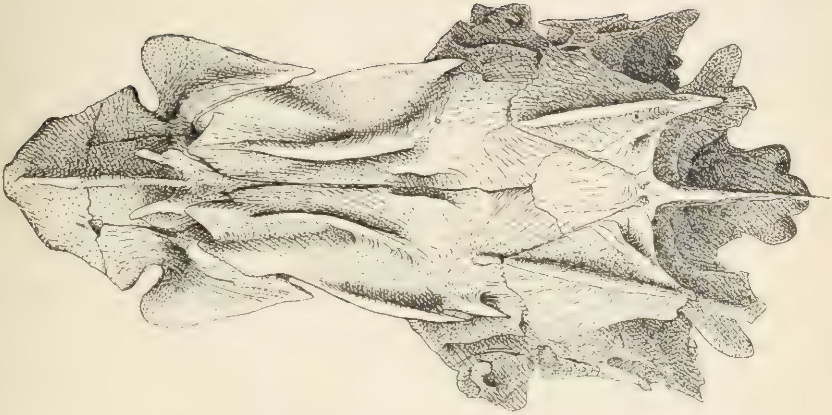


27. SEBASTODES RASTRELLIGER

BROWN, DEL

LITH. BRITT



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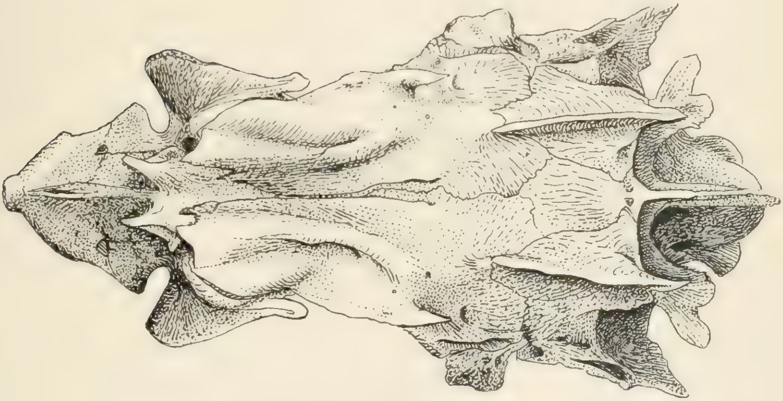

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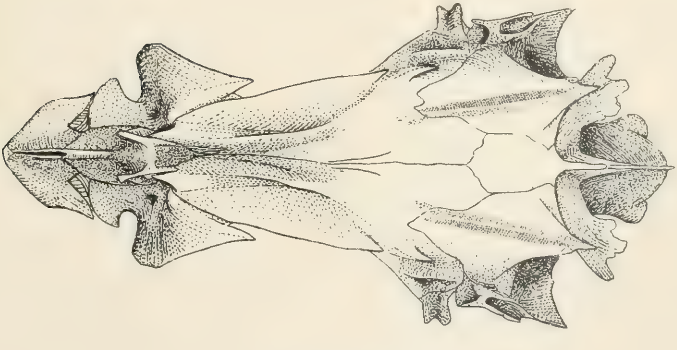

30. SEBASTODES MALIGER

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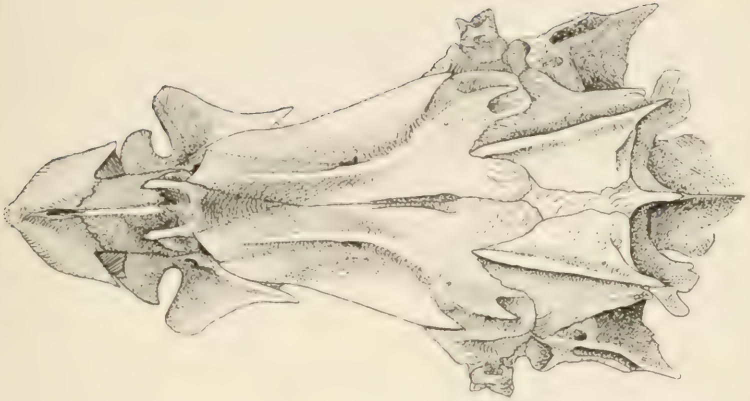
PLATE



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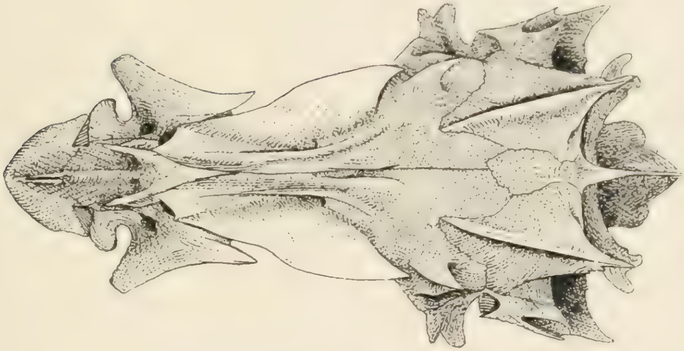

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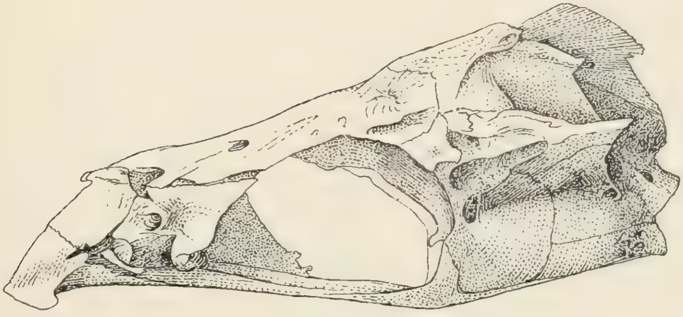
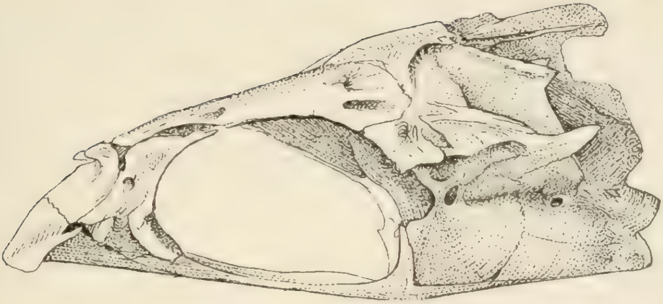


33. SEBASTODES PAUCISPINIS

.Brown del.

Lith. Brit



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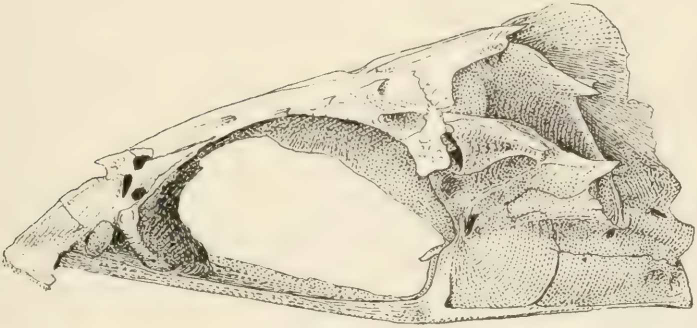
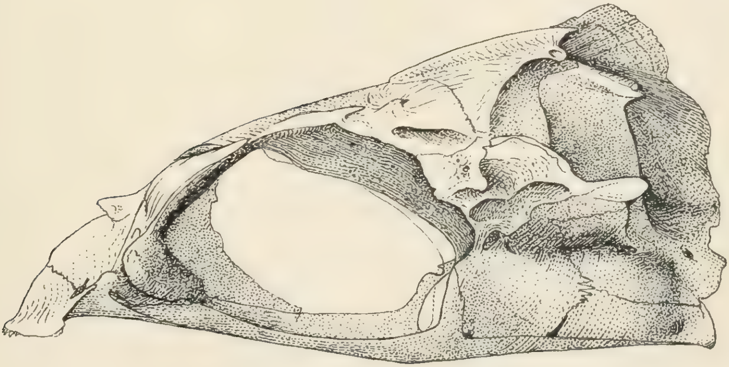


35. SEBASTODES MINIATUS



36. SEBASTODES ATROVIRENS

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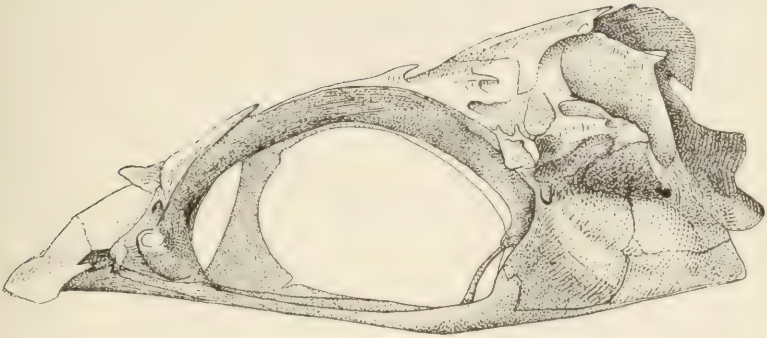
Lith Britton &

PLATE LXVI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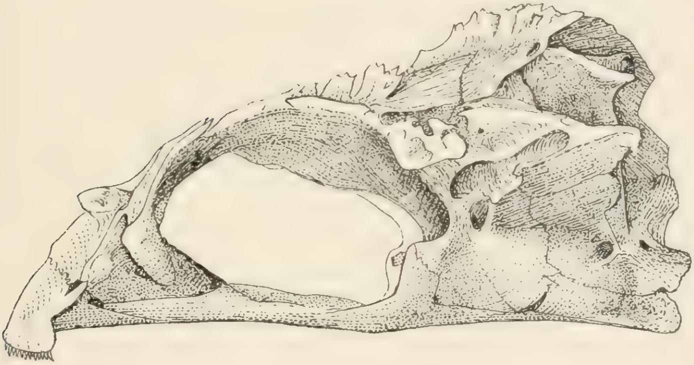
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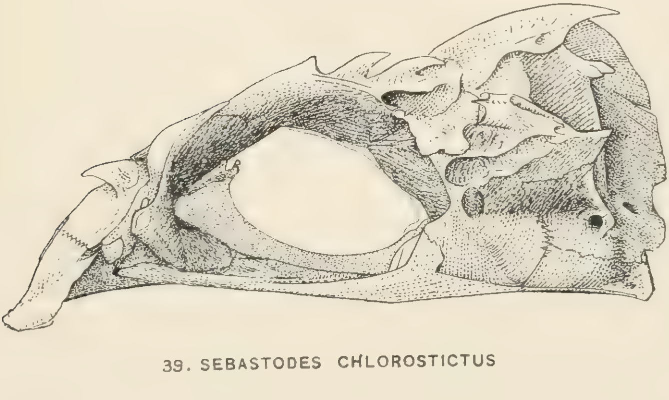
39. SEBASTODES CHLOROSTICTUS

WN, DEL.

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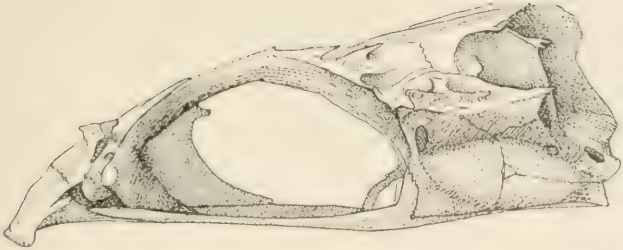

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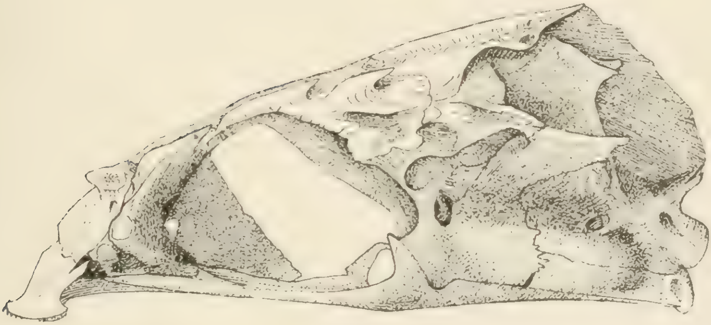

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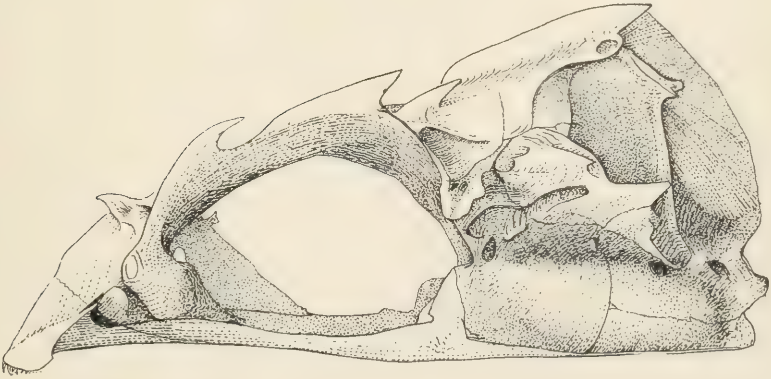

42. SEBASTODES NEBULOSUS

University Publications.

The Tariff Controversy in the United States, 1789-1833. With a Summary of the Period before the Adoption of the Constitution. By ORRIN LESLIE ELLIOTT, Ph. D. pp. 272. Price, $1.00.

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On the Cranial Characters of the Genus Sebastodes. By FRANK CRAMER. pp. 38. Price, 35 cents.

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THE HOPKINS LABORATORY OF BIOLOGY

III

THE FISHES OF PUGET SOUND

BY

DAVID STARR JORDAN AND EDWIN CHAPIN STARKS.

LELAND STANFORD JR. UNIVERSITY,
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III

THE FISHES OF PUGET SOUND

BY

DAVID STARR JORDAN AND EDWIN CHAPIN STARKS.

(Reprint from the Proceedings of the California Academy of Sciences, Series 2, Vol. V.)

LELAND STANFORD JR. UNIVERSITY,
PALO ALTO, CALIFORNIA,
1895.

PREFATORY NOTE.

This memoir is the third of a series designed to illustrate the investigations and explorations of the Hopkins Seaside Laboratory, an adjunct of the biological laboratories of the Leland Stanford Junior University. The series is issued under the patronage of Timothy Hopkins, Esq., of Menlo Park, California. The present paper is published with the co-operation of the California Academy of Sciences, appearing simultaneously in its present form and as part of the Proceedings of the Academy.

CHARLES H. GILBERT,
OLIVER P. JENKINS,
Editors.

Date of publication, December 21, 1895.

THE FISHES OF PUGET SOUND.*

BY DAVID STARR JORDAN AND EDWIN CHAPIN STARKS.

(With Plates lxxvi-civ.)

The present paper contains an enumeration of the fishes known to inhabit the waters of Puget Sound, a large estuary or fjord entering the northwestern part of the State of Washington. The paper is based primarily on a collection made by the junior author in July, 1895, under the auspices of the Hopkins Laboratory of the Leland Stanford Junior University, he being the guest of the "Young Naturalists' Society of Seattle."

This society undertook at this time a dredging expedition for the special purpose of collecting invertebrates. Through the interest of Mr. Timothy Hopkins, the junior author was enabled to take part in this work.

Nearly two weeks in July were devoted to dredging. A small steamer was chartered for this purpose. A camp was established at Point Orchard on Admiralty Inlet, and collecting and dredging were carried on within a radius of twenty miles from that point.

Besides the fishes that were brought up in the dredge, collections were made of "rock-pool" fishes at low tide, and seines were worked along the beaches.

After the return of the dredging expedition, the fresh waters about Seattle were seined, with the help of different members of the Naturalists' Society. This fresh water collection is described by Mr. Alvin Seale, in an appendix to the present paper.

Besides the work done about Seattle, a week was spent by the junior author at Neah Bay, near Cape Flattery, in the Straits of Juan de Fuca. Here a collection of the rock-pool fishes was made. A rich field for this work

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* Contributions to Biology from the Hopkins Seaside Laboratory, No. 3.

PROC. CAL. ACAD. SCI., 2D SER., VOL. V. December 14, 1895.

was found on Waadda Island, a small rocky islet, lying about half a mile from the shore, near Neah Bay. In this same locality large collections were made in 1880 by Professors Jordan and Gilbert.

Previous to this expedition a small but very valuable collection of fishes had been presented to the Leland Stanford Jr. University by the Young Naturalists' Society. The new forms in this collection are described in the present paper by Jordan and Williams. In the present list are also included the species enumerated by previous writers as occurring in Puget Sound and the Straits of Juan de Fuca. In the list published in 1880 by Jordan and Gilbert ninety species are mentioned as found in these waters. From this list we have drawn freely in our present records of the habits of species. In a later list by Dr. Carl H. Eigenmann (1892), 106 species are recorded. In the present list 141 species are recorded from these waters.

The junior author wishes to express here his obligations for the many favors extended to him by the different members of the Young Naturalists' Society, who did all that was in their power to make his part of the expedition a success. He is under particular obligations to Mr. Charles L. Denny and Mr. Edward S. Meany, who helped him in many ways, both in the dredging trip and on his trip to Neah Bay. He is indebted also to Mr. Henry H. Hindshaw for entertainment in Seattle and help of various kinds. Valuable aid was also given by Mr. Adam Hubbert, Miss Adella M. Parker, Miss Maud Parker, Mr. Trevor Kincaid, Mr. J. W. Busby, Mr. Albert Bryan, Miss Robeson, Mrs. J. E. Chilberg, Mrs. H. H. Hindshaw, Prof. O. B. Johnson, Prof. C. V. Piper, Mr. Oscar Piper, and Miss Newell, members of the society in question. Further acknowledgment is due to the kindly interest of Messrs. Goodall & Perkins, representing the Pacific Coast Steamship Company.

The following species are here described as new to science, the types of all of them being deposited in the Museum of the Leland Stanford Junior University as gifts from the Hopkins Laboratory or from the Young Naturalists' Society of Seattle. The new genera are indicated in full-face type.

Ruscarius *meanyi*. No. 3127.
Oligocottus embryum. No. 3128.
Gilbertina *sigalutes*. No. 3129.
Averruncus *emmelane*. No. 3135.
Xystes *axinophrys*. No. 3130.
Lethotremus *vinolentus*. No. 3131.
Neoliparis floræ. No. 3019, 3133.
Liparis dennyi. No. 3703.
Bryostemma *nugator*. No. 3134.
Xiphistes *ulvæ*. No. 3132.

Besides these species, the following additional new species are described from other localities:

Zalarges *nimbarius*. No. 3125. Open sea.
Hexagrammus otakii. Tokio, Japan.
Podothecus veternus. Robin Island, Alaska.
Podothecus accipiter. Robin Island, Alaska.

The following additional generic names are here used for the first time:

Astrolytes, Pallasina, Stelgis, Quietula, Ronquilus and **Xererpes.**

The fish fauna of Puget Sound marks a transition from the California fauna characterized by the abundance of *Scorpænidæ*, *Embiotocidæ*, etc., to that of Alaska, in which *Cottidæ*, *Agonidæ* and the Arctic types of *Blennies* are dominant. Here both classes occur, though less abundant than in their respective regions. The present collection is chiefly from depths greater than those reached by Jordan and Gilbert, who collected largely in Puget

Sound in 1880. The extensive collections made by the Albatross in the north have been mostly from much greater depths.

The plates of the present paper are all drawn by Miss Anna L. Brown, artist of the Hopkins Seaside Laboratory.

Family PETROMYZONIDÆ.

1. **Entosphenus tridentatus** (Gairdner).

Common; ascending the fresh waters in spring to spawn, reaching a length of over 2 feet. It is not used as food. Not taken by us.

2. **Lampetra cibaria** (Girard).

Not rare; ascending streams, reaching a length of 8 inches; not used as food. Not taken by us.

Family HEXANCHIDÆ.

3. **Notorhynchus maculatus** Ayres.

Recorded (as *Notorhynchus borealis)* from Nisqually, Washington, by Dr. Gill. Not taken by us.

4. **Hexanchus corinus** Jordan & Gilbert.

Originally described from Neah Bay and from the Bay of Monterey. Not seen by us.

Family GALEIDÆ.

5. **Prionace glauca** (Linnæus). BLUE SHARK.

Recorded by Jordan & Gilbert; rare. Not seen by us.

Family DALATIIDÆ.

6. **Somniosus microcephalus** (Bloch). GROUND SHARK.

Not uncommon. A very sluggish shark. Recorded by Jordan & Gilbert from Victoria. A stuffed specimen from Seattle in the Museum of the Young Naturalists' Society.

Family SQUALIDÆ.

7. **Squalus sucklii** (Girard). DOG-FISH.

Exceedingly abundant. Taken in great numbers with set lines. It is valued for the oil extracted from its liver.

Family RAJIDÆ.

8. **Raja rhina** Jordan & Gilbert.

Not uncommon; reaches a length of 32 inches. Not taken by us.

9. **Raja binoculata** (Girard). COMMON SKATE; RAY.

Common on sandy shores. Reaches a length of 6 feet and a weight of over 60 pounds. One small specimen obtained, very prettily marked with large ocellated spot on the base of pectorals, which fades in the adult. Several of the egg cases of this species were dredged from deep water, where they lie apparently unprotected on the sandy bottom.

Family CHIMÆRIDÆ.

10. **Hydrolagus colliæi** (Lay & Bennett). RAT-FISH.

Numerous specimens taken on sandy beaches at night with a seine, where they were attracted by a camp-fire. It reaches a length of 2½ feet.

Family ACIPENSERIDÆ.

11. **Acipenser transmontanus** Richardson. WHITE STURGEON.

Common; running up the rivers in the spring. It reaches a length of 15 feet and a weight of 300 to 400 pounds. Used largely as food, although its flesh is coarse. Not taken by us.

12. **Acipenser medirostris** Ayres. GREEN STURGEON.

Not common. Reaches a large size, but is not used as food. Not taken by us.

Family NEMICHTHYIDÆ.

13. **Nemichthys avocetta** Jordan & Gilbert.

The type of this species was taken near Port Gamble in 1880, by Prof. O. B. Johnson of the University of Washington. It was presented to the U. S. National Museum by President A. J. Anderson. Mr. Ashdown H. Green of Victoria, B. C., reports a second specimen as recently taken near Victoria and preserved in the museum of that town.

Family CLUPEIDÆ.

14. **Clupea pallasi** Cuvier & Valenciennes. HERRING.

Exceedingly abundant. Smoked and salted in large numbers. Mr. J. P. Hammond[*] states that from 18 to 25 years ago it was not an uncommon occurrence for a "gang" of fishermen to catch from 200 to 300 barrels of herring in a night on Puget Sound. Now the largest night's work is 20 barrels.

15. **Clupanodon cæruleus** (Girard). SARDINE.

This sardine occurs in large numbers in the warmer part of the season.

[**Alosa sapidissima** (Wilson). SHAD.

This species was introduced into the Pacific about 1878, and was first noticed in Puget Sound in 1884. They are slowly increasing in number, although the catch is as yet unimportant. Specimens of 6½ pounds in weight have been taken in the Sound. Not seen by us.]

Family ENGRAULIDÆ.

16. **Engraulis mordax** Girard. ANCHOVY.

Abundant; occurring in immense schools. Chiefly used for bait. Not taken by us.

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[*] American Angler, December 18, 1886.

Family SALMONIDÆ.

17. **Oncorhynchus tschawytscha** (Walbaum). QUINNAT SALMON; CHINNOOK SALMON; TYEE* SALMON.

The first salmon to appear each season, abundant from August to October. It commonly weighs about 17 (11 to 20) pounds, but specimens weighing 70 pounds are on record. The most important fish on the Pacific Coast. In Puget Sound it is not very abundant, and being obtained late in the season, its flesh is somewhat lean and dry, ranking with the silver salmon, with which it is usually canned. In the Columbia River this species is canned early in the season, and its quality then is much superior to that of any salmon canned in Puget Sound.

18. **Oncorhynchus kisutch** (Walbaum). SILVER SALMON; SKOWITZ.

Abundant from August to November. It reaches a length of 30 inches and a weight of 4 to 8 pounds. It is largely canned at Seattle under the name of Red Salmon. Its flesh is very red, but dry and not richly flavored, being much inferior to the Quinnat or "Tyee."

19. **Oncorhynchus keta** (Walbaum). DOG SALMON; LE KAY.

Abundant; reaches a weight of 20 pounds. It is only eaten by the Indians, as it runs late in the fall when its flesh is very dry and poor. One small specimen taken.

20. **Oncorhynchus gorbuscha** (Walbaum). HUMPBACK SALMON; HADDO.

The smallest of the salmon, reaching a weight of 7 pounds. It is very abundant on alternate years in the Sound (1893, 1895, etc.), being wholly unknown in even

---

*Tyee, the common Chinnook name for this species on Puget Sound, is said to mean *king* or *chief*.

years. It is dark in color, with pale flesh and is regarded as the poorest of the salmon, although its inferiority to the silver salmon is in appearance rather than in taste. It is, however, canned in large numbers, and is of economic importance.

21. **Oncorhynchus nerka** (Walbaum). SUKKEGH; BLUE-BACK SALMON.

Abundant, reaching a weight of from 4 to 8 pounds. Often landlocked in the lakes. In value intermediate between the "Tyee" and the "Skowitz" or Silver Salmon. The male in the fall is known as "red-fish."

22. **Salmo mykiss** Walbaum. CUT-THROAT TROUT.

Found in abundance in salt water in Puget Sound. It often reaches 8 or 10 pounds, but specimens weighing much more have been taken.

23. **Salmo gairdneri** Richardson. STEELHEAD.

Common near the head of Puget Sound. Considerable quantities are taken for the market. It sometimes reaches 14 to 18 pounds in weight. It is now canned regularly with the silver salmon.

24. **Salvelinus malma** (Walbaum). DOLLY VARDEN TROUT.

Abundant. In Puget Sound it is taken from salt water in large numbers. An excellent food fish, reaching in salt water a weight of 11 pounds or more. Locally known as bull trout or salmon trout.

Family ARGENTINIDÆ.

25. **Hypomesus pretiosus** (Girard). SURF SMELT.

Very common on sandy beaches in Puget Sound. It reaches a length of a foot and becomes very fat. It is a food fish of great value. Several specimens obtained. A beautiful, symmetrical little fish.

26. **Thaleichthys pacificus** (Richardson). EULACHON; CANDLE-FISH.

Abundant in the spring; not taken by us. A fine food fish. Reaches a length of about 10 inches. A fisherman at Olympia says that this species buries itself in the sand of the beach, in the same fashion as the species of *Ammodytes*.

27. **Osmerus thaleichthys** Ayres. SMELT.

Common, but not of great importance as a food fish. Length about 6 inches. Not taken by us.

Family MYCTOPHIDÆ.

28. **Tarletonbeania crenularis** (Jordan & Gilbert).

A specimen taken off Vancouver Island in 1880 by Dr. Tarleton H. Bean, who gave it the manuscript name of *Myctophum procellarum*. Not taken by us.

29. **Myctophum californiense** Eigenmann & Eigenmann.

Recorded from Vancouver Island by Dr. Günther under the name of "*Scopelus boops;*" more common southward in deep water. It is perhaps not distinct from *Myctophum humboldti*.

Family CHAULIODONTIDÆ.

30. **Zalarges nimbarius** Jordan & Williams, n. gen. and sp. Plate lxxvi.

Head 4 in length to base of caudal; depth 5; D. 9, A. 15. Scales probably present in life, but no traces left except a few impressions. Muscular bands about 42.

Body moderately elongate, subfusiform, formed somewhat as in a stickleback, the tail tapering and slender, the belly broad and not carinate, the sides moderately compressed. Anterior profile of head rising evenly, not convex; a slight depression before eye. Mouth large, low, oblique, the lower jaw somewhat projecting. Premaxillaries short; maxillaries long, expanded, the lower edge curved, overlapping the dentary bones. Maxillaries extending beyond eye, to angle of preopercle, as in *Stolephorus*, their length $1\frac{2}{3}$ in head, their tip acutish. Eye very large, 3 in head; snout 4. Bones of lower jaw thin, broadly expanded, meeting across the throat at the articular joint, leaving a club-shaped naked area under the chin. Entire edge of maxillary armed with a single series of slender sharp teeth, somewhat unequal, some of them forming slender canines, which are however but little longer than the other teeth and not fang-like. Teeth in lower jaw similar, those of both jaws largely directed forward. No teeth on vomer or tongue; a row of small slender teeth on each palatine bone. No pseudobranchiæ. Gill-rakers rather long and slender, about $5+17$ in number, the longest about half eye. Branchiostegals short, 8 in number. Opercle short and thin; scarcely striated; subopercle and interopercle developed.

Photophores large and conspicuous, forming convex pearly bodies on a dark background. Two series in a straight line along lower part of sides, making four series in all. The two lower series run from chin to the caudal fin, 47 in each series, $10+13+9+8+7=47$. The two upper rows begin under chin at front of isthmus and extend to front of anal fin, 24 in each row, $10+13+11$; 8 photophores along branchiostegal membranes, one for each ray, all overlapped but not hidden by the broad transparent rami of the lower jaw; one photophore on preopercle, one on subopercle, one on preorbital, and one at lower posterior margin of eye; 2 under tip of chin.

Dorsal fin low, inserted on posterior half of body, somewhat behind ventrals, at a point midway between preopercle and base of caudal, its last rays extending over the anterior third or fourth of anal; adipose fin not evident, perhaps obliterated. Caudal apparently lunate, 1 2/5 in head. Anal low, its base 1 1/3 in head. Ventrals 2 1/4 in head, inserted midway between front of eye and base of caudal. Pectorals inserted very low, narrow and pointed, 1 2/5 in head.

Back brownish, the sides burnished silvery; silvery area on cheeks Y-shaped, the Y placed obliquely. Fins with some dark dots, these forming obscure bars across caudal; dark specks on back of caudal peduncle, and across base of caudal; some dark dots elsewhere on body.

Type two specimens, each 2 3/8 inches long, and in good condition, numbered 3125 on the register of Leland Stanford Jr. Museum. They were cast up in a storm and thrown by the waves on the deck of a vessel coming in from Australia. The exact locality in the open Pacific is not known. The types were presented by the Young Naturalists' Society to the Museum of Stanford University.

The new genus *Zalarges* seems to belong to the *Chauliodontidæ*, near the Atlantic genus *Yarrella* Goode & Bean. It may be thus defined: Body subfusiform, moderately compressed, probably covered in life with thin caducous scales. Head subacute, the membrane bones normal, thin; mouth large, with expanded maxillary and mandibular bones; lower jaw projecting. Teeth very slender, unequal, uniseral, none on tongue or vomer; no fangs. Eye large. Gill openings very wide; gill-rakers long and slender; branchiostegals 8; no pseudobranchiæ. Photophores conspicuous, in two rows on each side of belly, the upper row ceasing at front of anal; some detached photophores on head. Dorsal short, on posterior half of body, slightly overlapping the short anal. Ventrals inserted before dorsal. Pectorals narrow and low. Coloration silvery. (*Ζάλη*, surges; *ἀργὴς*, silvery.)

Family ALEPISAURIDÆ.

31. **Alepisaurus borealis** Gill.

Very rare; in deep water. A head from Puget Sound is in the Museum of the California Academy of Sciences.

Family PARALEPIDÆ.

32. **Arctozenus coruscans** (Jordan & Gilbert).

The sole specimen known was taken at Port Townsend in 1880, by Jordan & Gilbert. It is in the U. S. National Museum.

Family AMMODYTIDÆ.

33. **Ammodytes personatus** Girard. SAND LANCE.

Found in immense schools along sandy beaches in Puget Sound. It burrows in the sand between tide marks. It reaches a length of 5 or 6 inches. Two specimens taken.

Family AULORHYNCHIDÆ.

34. **Aulorhynchus flavidus** Gill.

Abundant in sheltered bays. It reaches a length of 5 or 6 inches.

Family GASTEROSTEIDÆ.

35. **Gasterosteus microcephalus** Girard.

Abundant. Specimens obtained in brackish water near Ballard, Seattle. Length 2 inches.

36. **Gasterosteus catraphractus** Pallas.

Specimens obtained in abundance, from 3 to 3½ inches in length. It lives on sandy beaches and spawns in the latter part of July and in August.

Family SYNGNATHIDÆ.

37. **Siphostoma californiense** (Storer). PIPE FISH.

Not very common. It reaches a length of 18 inches.

Family STROMATEIDÆ.

38. **Rhombus simillimus** (Ayres). PÁMPANO.

Rare in Puget Sound. Not taken by us.

Family BRAMIDÆ.

39. **Brama raii** Bloch. POMFRET.

A specimen taken at Port Townsend by Mr. James G. Swan, and reported by him as being not uncommon off Vancouver Island. It reaches a length of about 20 inches. Recently numerous specimens have been taken off San Francisco and Monterey. Not taken by us.

Family EMBIOTOCIDÆ.

40. **Damalichthys argyrosomus** (Girard). WHITE PERCH.

Very abundant; many specimens obtained. It reaches a weight of 2 pounds, and is a common food fish, though not of high quality.

41. **Tæniotoca lateralis** (Agassiz). STRIPED PERCH.

Very common; a brilliantly colored fish. A number of specimens taken. It reaches a weight of 2 pounds, and is an important food fish, finding a ready sale, although the flesh is somewhat poor.

42. **Embiotoca jacksoni** Agassiz. BLUE PERCH; SURF FISH.

Somewhat scarce. It reaches a weight of 1½ pounds. Its flesh is poor. A few specimens obtained.

43. **Brachyistius frenatus** Gill.

Not very abundant; not used as food. Weight ¼ pound.

44. **Cymatogaster aggregatus** Gibbons. SHINER.

The most abundant species of the group. It is small in size and is only used for bait. Several specimens taken.

Family SCORPÆNIDÆ.

45. **Sebastodes melanops** (Girard). "BLACK BASS."

Abundant in Puget Sound and a food fish of value.

46. **Sebastodes mystinus** (Jordan & Gilbert). PRIEST FISH.

Scarce, but more common farther south. No specimens taken by us.

47. **Sebastodes pinniger** (Gill). RED ROCK COD.

Abundant in rather deep water. Not taken by us.

48. **Sebastodes ruberrimus** Cramer. RED ROCK FISH; TAMBOR.

Taken with hook and line in some abundance in Puget Sound.

49. **Sebastodes caurinus** (Richardson).

Very common; brought into the market in abundance. This species has not been found south of Puget Sound, being replaced southward by the very closely allied *Sebastodes vexillaris*. Several specimens obtained by us in the seine.

50. **Sebastodes auriculatus dalli** (Eigenmann & Beeson).

Common; a shallow water species. Many specimens taken with a seine. The specimens of *Sebastodes auriculatus* from Puget Sound are very dark in color, and about half of them lack the coronal spines which are especially characteristic of *Sebastodes auriculatus* on the coast of California. The name *dalli* seems to have been given to a specimen of this type taken at San Francisco. Pending investigation we may adopt the subspecific name *dalli* for the Puget Sound form of this species.

51. **Sebastodes maliger** (Jordan & Gilbert).

Found by Jordan & Gilbert to be a common species in the Straits of Juan de Fuca. Reaches a weight of 6 pounds. Not taken by us.

52. **Sebastodes nebulosus** (Ayres). ROCK COD.

Rather common. No specimens taken by us.

53. **Sebastodes nigrocinctus** (Ayres).

This peculiarly marked rock fish was found by Jordan & Gilbert to be common in the entrance to the Straits of Juan de Fuca, in deep water. No specimens obtained in Puget Sound.

Family HEXAGRAMMIDÆ.

54. **Hexagrammus decagrammus** (Pallas).

Said to be quite common, but less abundant than *Hexagrammus asper*. Not taken by us.

55. **Hexagrammus ordinatus** (Cope).

Taken at Port Angeles, on the south shore of the Straits of Juan de Fuca, by the Albatross. Not seen by us.

56. **Hexagrammus asper** Steller. *Hexagrammus superciliosus* (Pallas).

Not abundant and not taken by us.

57. **Hexagrammus hexagrammus** (Pallas). STARLING.

Abundant everywhere in Puget Sound. It lives about rocky places, and is taken in large numbers with hook and line and nets. It reaches a length of about 16 inches and a weight of 2 or 3 pounds. It is a food fish of fair quality, but inferior to the species of Sebastodes. This is the southern limit of this species. Several specimens were obtained by us.

We may here record a new species of Hexagrammus from Tokio, Japan, hitherto confounded with the American species *Hexagrammus hexagrammus*.

Hexagrammus otakii Jordan & Starks, n sp. Plate lxxvii.

Head 4 in length to base of caudal; depth $4\frac{1}{3}$; dorsal XIX-23; anal 21; scales 21-106-34; eye $4\frac{1}{2}$ in head; snout $3\frac{1}{3}$; highest dorsal spine $2\frac{1}{2}$; highest dorsal ray $2\frac{1}{3}$; highest anal ray 3; pectoral $1\frac{1}{4}$; ventral $1\frac{2}{3}$; caudal $1\frac{1}{2}$.

Body elongate, not greatly compressed, the head small and pointed. Mouth not large, the maxillary reaching slightly past the vertical from anterior rim of orbit; jaws subequal; teeth conical and sharp, the outer row enlarged, smaller on vomer, none on palatines; interorbital space broadly convex; a wide, short, multifid dermal flap over posterior edge of each eye.

Head scaled above to slightly in front of eyes, opercle and cheek entirely and densely covered with small scales; snout, preorbital, suborbital, lower jaw and interopercle naked. Scales everywhere, except on cheeks and opercles, strongly ctenoid.

Lateral lines 5 on each side; the upper one from nape parallel with dorsal, stopping under the beginning of posterior fourth of soft dorsal, sometimes uniting with the second lateral line at this point, not joining its fellow of the opposite side in front of dorsal; the second running parallel with it, continued to base of caudal, situated below the first in distance equal to half eye; the third, parallel with curve of back, running from the upper end of the gill-opening to the base of the caudal; the fourth short, beginning slightly in front of ventral, past the outer edge of its base, not reaching to its tips; the fifth parallel to anal, in distance above it equal to space between upper lateral lines, barely reaching base of caudal posteriorly, anteriorly joining its fellow of the opposite side between vent and base of anal, continuing simple forward. Of four specimens examined, in two it stops at the base of ventrals, in the others it ends midway between that point and isthmus.

First and second dorsal and anal subequal in length of base; spinous dorsal very slightly higher than soft dorsal, its origin slightly behind upper end of gill-opening, the notch between it and soft dorsal shallow; origin of anal midway between front of eye and base of caudal, its rays shorter than those of soft dorsal; pectoral short and wide, the rays toward the upper edge the longest, the tips of which reach to end of ventrals; origin of ventrals behind that of pectorals a space equal in distance to length of snout; caudal short, shallowly lunate.

Color light brown above, white or yellowish below, variously marked with irregular dark brown mottlings and spots arranged chain-like; top of head and snout dark; dorsals dark and mottled; pectorals crossed with irregular bars; ventrals dusky, not black at tips; anal dusky and mottled, the end of each ray white.

Four specimens, collected by Mr. Keinosuke Otaki, a graduate of the Department of Zoology in Stanford University, now a member of the Fish Commission of Japan. They are from the markets at Tokio, Japan, the largest about 9 inches in length.

This is the species recorded from Tokio by Dr. Steindachner (Beitr. Kenntniss Fische Japans, iv, 66) as *Hexagrammus asper*. It is not likely that the latter American species occurs in Japan.

58. **Ophiodon elongatus** Girard. CULTUS COD; BLUE COD.

Abundant. An important food fish, reaching a weight of 60 pounds.

59. **Oxylebius pictus** Gill. Plate lxxviii.

Not uncommon, living among the rocks near shore. Not taken by us.

60. **Zaniolepis latipinnis** Girard.

Rare in Puget Sound. It reaches a length of a foot. Two specimens obtained by Prof. O. B. Johnson are in the Museum of the Young Naturalists' Society.

61. **Anoplopoma fimbria** (Pallas). BLACK COD; BESHOWE.

Common in Puget Sound, where it is valued as a food fish. It reaches a length of 40 inches.

Family COTTIDÆ.

62. **Jordania zonope** Starks. Plate lxxix.

Jordania zonope Starks, Proc. Ac. Nat. Sci., Phila., 1895, p. 410. The three type specimens of this singular fish were collected in channel rocks near Point Orchard. The largest specimen (No. 3124 L. S. Jr. Univ.) is 4 inches long. This species has 10+36=46 vertebræ, a number considerably in excess of that found in the related genera *Icelus* and *Artedius*.

The following is the original description of *Jordania zonope:*

Genus JORDANIA Starks.

Allied but not closely to *Triglops* and *Chitonotus*.

Body elongate, not greatly compressed; head moderate, partly scaled, with dermal flaps above. Mouth moderate, with bands of villiform teeth on jaws, vomer, and palatines. Body above lateral line closely covered with strongly ctenoid scales; lower half of body with narrow, parallel plate-like folds of skin, running obliquely downward and backward from lateral line to within a short distance of anal fin, the posterior edge of each fold finely and sharply serrate. Gill-membranes united, free from isthmus; a slit behind last gill. Spinous dorsal with very long base of about 17 spines, longer than the soft dorsal; anal long; ventrals I, 5, inserted behind base of pectorals.

Jordania zonope Starks.

Head 3½ in length of body; depth 5½; dorsal XVII–15; anal 22; lateral line 50; orbit 3⅔ in head; maxillary 3⅓; longest dorsal spine 1⅚; longest dorsal ray 2⅕; longest anal ray 2⅓; length of ventrals 1¾; pectorals ¼ longer than head; caudal 1⅘.

Body rather elongate, compressed posteriorly, not much anteriorly, the back not elevated; dorsal and ventral outlines almost straight from head to caudal peduncle.

Head not large, profile from front of dorsal to eyes nearly horizontal and straight, then abruptly turning steeply downward to end of snout, lower profile gently curved from chin to ventral fins.

Mouth small, the maxillary not reaching the vertical from front of orbit; jaws about equal or the lower slightly projecting; teeth in villiform bands on jaws, vomer, and palatines; eyes large, set high in head, a little shorter than snout; interorbital space deeply concave, half as wide as eye; a slip of skin, half as long as the diameter of the eye, over the anterior edge of each eye, and a longer one over the posterior edge; a few minute fleshy slips on nape; nasal spines long and sharp, somewhat curved back; spine on preopercle simple, hooked up, a minute spine above it, and a blunt spine below; posterior end of interopercle prominent, forming a blunt spine; opercle produced posteriorly in a flap, which lies in a shallow groove in the shoulder girdle; no opercular spine; gill-membranes united, but not joined to the isthmus; a distinct slit behind fourth gill arch; branchiostegals 5.

Top of head to middle of eyes, opercles and upper part of preopercles closely covered with small rough scales; head otherwise naked; body above lateral line completely covered with ctenoid scales, not very regular in size, arranged in about 67 series; lower half of body covered to within a short distance of anal with about 50 oblique plate-like folds of skin, the posterior edges of which are finely and sharply serrate, the pores of lateral line are situated in the upper end of these folds; pectoral base, belly and a narrow space along base of anal, naked; fins, with the exception of pectoral, which has a few rough scales on the rays, naked.

Dorsal spines slender, the first one inserted in advance of pectoral base, directly over the upper end of gill-opening, the fin somewhat round in outline, the spines not varying greatly in length, with the exception of two or three on each side; soft dorsal a little lower than spinous, the rays subequal, its base is a little shorter than the base of first dorsal, and slightly longer than the length of head; ventral fins long, their tips reaching past front of anal fin, their length equal to the distance from snout to edge of preopercle, the pubic bone very prominent; pectoral fins long and curved upward, the middle rays the longest, reaching far past tips of ventrals and front of anal to the space between dorsals; the ends of lower rays free, the width of the fin at its base is contained three times in the length of the head; caudal rounded.

Color in spirits blackish, with traces of 4 or 5 darker cross-bars on back, sides below lateral line mottled, faint dark spots along lateral line, more conspicuous posteriorly; a dark bar half as wide as eye, running from eye downward across cheek to anterior end of interopercle; bordered on each side by a light streak, a similar bordered bar running across top of head, slightly turning around posterior margin of orbit, downward along margin of preopercle, and ending on posterior end of interopercle; snout abruptly black, lips dark: fins all dark and slightly mottled, tips of ventral, anal, and caudal rays a little lighter; caudal and pectoral dark at base: slips on top of head black; belly very finely dusted with minute dark points.

This species is not uncommon in Puget Sound: the types are three specimens taken in channel rocks at Point Orchard, near Seattle, by Miss Maud Parker and Mr. Adam Hubbert, members of the Young Naturalists' Society of Seattle. The largest of these is 4 inches in length. The types are in the Museum of the Leland Stanford Junior University, numbered 3124. Unfortunately the life colors of this brilliant species were not taken. There is in life much red on the lateral plates and elsewhere on the body and fins. This disappears at once in alcohol.

63. **Radulinus asprellus** Gilbert. Plate lxxxi.

Not common; two specimens dredged near Seattle, the larger about 4 inches in length.

64. **Chitonotus pugettensis** (Steindachner).

Not common; two specimens obtained with a seine. It reaches a length of 9 inches.

65. **Ruscarius meanyi** Jordan & Starks, n. gen. and sp. Plate lxxx.

Head 2½ in length; depth 3½; dorsal X–14; anal 12; lateral line 6–32; orbit 4 in head; maxillary 2; snout 4; highest dorsal spine 3; highest dorsal ray 3; pectoral 1½; ventrals 2⅔; caudal 2⅓.

Body robust, deepest and broadest at shoulders, tapering quickly backwards into a slender caudal peduncle; back somewhat elevated; ventral outline nearly straight from chin to caudal fin; dorsal outline gently and evenly curved from snout to caudal peduncle.

Mouth terminal and nearly horizontal, maxillary reaching past pupil nearly to posterior edge of orbit; jaws subequal; teeth in narrow villiform bands on jaws, vomer and palatines; process of premaxillary prominent, extending between and above nasal spines; preopercular process well developed, long, near its tip a very small second spine is developed, making the process befurcate, 3 or 4 short spines below on edge of preopercle; opercle ending in a flap; top of head with dermal flaps, one over anterior margin of eye, and a group of 2 or 3 over posterior margin; a few shorter ones on nape; mucous pores around mandible, large; opercle, upper part of preopercle, top of head to eyes, and the orbital ring covered with sharply ctenoid scales, upper part of eyeball with small rough scales, balance of head naked.

Lateral line with a row of rough plates; upper half of body completely covered with scales, their anterior edge imbedded, coarsely ctenoid on their posterior edge; lower half of body naked.

Dorsal spines slender, those in the middle highest, the fin without a notch, the longest spines reaching to front of soft dorsal where fin is depressed, well separated from soft dorsal; first dorsal ray inserted over first anal ray, the fin longer and higher than anal; pectorals somewhat pointed posteriorly, reaching just past the space between dorsals; ventrals inserted behind the base of pectorals a distance equal to the length of snout, their tips reaching to the front of the anal; caudal slender, rounded behind.

Color olive gray, belly dusky; back with dark cross shades, irregular in number and size, below lateral line light with small wavy bars running across to within a short distance of anal fin, then fading out; head with cross shades above; a dark bar from eye to side of snout, one from eye downwards past end of maxillary, another behind it across posterior edge of preopercle; some dark markings on maxillary; lower lip dark; pectorals light, with dark wavy lines across them; dorsal fins dark and mottled; anal and ventrals varying from white to black; caudal with a dark bar at base, light with irregular dark cross markings.

Two specimens dredged, about 1½ inches in length. They are in the Leland Stanford Jr. University Museum, No. 3127.

This species is the type of the new genus *Ruscarius*, allied to *Chitonotus*, but distinguished by the continuous dorsal, scaly back, and weak armature of the preopercle. It is named for Mr. Edmond Stephen Meany, Secretary of the University of Washington, in recognition of his work in the Young Naturalists' Society.

66. **Astrolytes fenestralis** (Jordan & Gilbert).

Common; several specimens obtained with a seine. It is not found in rock pools. It reaches a length of 5 inches. Vertebræ $8 + 25 = 33$. This species is the type of a distinct genus, *Astrolytes*, distinguished from *Artedius* by the scaly, rough, uneven cranium, and more strongly armed preopercle.

67. **Artedius lateralis** Girard.

Two specimens obtained with a seine; probably not abundant.

Color in alcohol very dark; the head black; the body dark olive green, with faint pale markings on sides above lateral line; below with numerous clear-cut white spots, irregular in size, none of them half as large as pupil; belly dusky or white; fins all jet black; first dorsal with 2 or 3 faint light bars across the spines running backward and downward; soft dorsal with 7 or 8 series of spots on the membrane, not involving the rays, running obliquely backward and downward; other fins plain black.

68. **Hemilepidotus hemilepidotus** (Tilesius).

Very abundant in shallow water among weeds, and in rocky places. It reaches a length of 15 inches; rarely used for food. Several specimens obtained with hook and line.

69. **Acanthocottus polyacanthocephalus** (Pallas).

Abundant. One of the largest cottoids, reaching a length of 2 feet. Specimens collected with the seine.

70. **Enophrys bison** (Girard).

Abundant. An exceedingly ugly-looking fish, reaching a length of 12 inches. It is not used for food. Several specimens obtained with the seine on sandy beaches.

71. **Leptocottus armatus** Girard.

The most common large cottoid in Puget Sound. It reaches the length of a foot, and is seldom used for food. Specimens obtained in abundance.

72. **Scorpænichthys marmoratus** (Girard).

Not uncommon; said to reach a weight of 20 to 25 pounds in Puget Sound. It is not valued as a food fish.

73. **Blennicottus globiceps** (Girard).

Rather common, in pools left in the sand by the tide. Several specimens taken near Neah Bay. The largest was 6½ inches long, this being the largest of this species on record. These specimens (subspecies *bryosus)* have many more cirri on the head than southern specimens.

74. **Oligocottus embryum** Jordan & Starks, n. sp. Plate lxxxii.

Head 4 in length; depth 4¼; dorsal IX–15; anal 10;

orbit 4 in head: snout 4: maxillary $2\frac{5}{6}$: highest dorsal spine $2\frac{1}{2}$; dorsal ray $1\frac{3}{4}$; anal ray $1\frac{3}{4}$; length of caudal fin $1\frac{2}{5}$; ventrals $1\frac{1}{6}$; pectorals $2\frac{1}{2}$ in body.

Body elongate, compressed, back slightly elevated, deepest under spinous dorsal: caudal peduncle moderately slender. Skin perfectly smooth.

Head small, tapering rapidly forward to the rather sharp snout as viewed from above: profile of head, straight below, acutely and evenly rounded above: mouth terminal, horizontal: maxillary reaching to the vertical from the middle of pupil: lower jaw included; teeth on jaws, vomer and palatines, in narrow villiform bands: process of premaxillary prominent, extending slightly above nasal spines, giving the appearance of three spines above snout; eye set high in head, the orbit as long as snout: preopercular spine short, blunt and triangular, entirely covered with the skin; edge of preopercle below, entire: opercle ending in a short flap: top of head with two rows of "mossy" cirri, running from the superior orbital margin, curving over head and continuing on lateral line; they disappear on its anterior third.

Dorsal spines rather stout, the fin lower than soft dorsal, rounded in outline; soft dorsal well separated from spinous, the front of fin the highest; pectorals long, the eighth ray the longest, rendering the fin pointed behind; it reaches to the base of about the seventh dorsal ray. The pectoral rays below the eighth are swollen, and posteriorly free from the membrane; anal about as high as soft dorsal, the rays somewhat swollen and more or less free: ventrals long, reaching about to front of anal, their insertion behind base of pectoral, a distance equal to the snout and eye; caudal fin slightly rounded.

Color varying from light green to a rich maroon; traces of 5 or 6 dark cross-bars on back, lower parts dusky with small light spots; belly white; a dark bar from eye to side of snout, one from eye to edge of preopercle behind end of maxillary, and another from eye to below preopercular spine; lips black; lower rays of pectorals crossed with black and white bars, which fade out above; ventrals light with some dusky mottlings; dorsal dark above, light at base, no markings; anal with black and white bars running across the rays, caudal fin mottled.

Two specimens collected in the tide pools left in the sand on a beach a couple of miles east of Neah Bay, the largest 2¾ inches in length. They are now in the Leland Stanford Jr. University collection, No. 3128.

A third specimen has been collected at Point Lobos, Monterey County, California, on Carmelo Bay, by Mr. John O. Snyder. This specimen is considerably brighter in color and the markings are more distinct.

75. **Oligocottus maculosus** Girard.

Very abundant. Specimens taken in large numbers in a muddy lagoon near Point Orchard. It is one of the smallest of the marine *Cottidæ*, not over 3 inches in length. A number of specimens were also taken at Neah Bay in tide pools. These differ from the others in being lighter in color, and in having many more cirri on the top of the head.

76. **Dasycottus setiger** Bean. Plate lxxxiii.

One small specimen brought up in the dredge, 1½ inches in length. Probably rare.

77. **Nautichthys oculofasciatus** (Girard).

Apparently not uncommon. Several small specimens collected in the rock pools and dredged from deep water. It reaches a length of 6 or 8 inches.

78. **Blepsias cirrhosus** (Pallas).

Not rare in Puget Sound, where it is taken in seines. It reaches a length of 6 inches. Not taken by us.

79. **Ascelichthys rhodorus** Jordan & Gilbert. Plate lxxxiv.

Plentiful at Waadda Island, Neah Bay. It is found under rocks between tide marks. Not a very active fish. This is the type locality where it was first taken by Jordan & Gilbert in 1880. It reaches a length of 3 inches. It occurs also on the rocky coast about Cape Mendocino in California.

Family PSYCHROLUTIDÆ.

80. **Psychrolutes paradoxus** Günther.

The original type from the Gulf of Georgia. Not obtained by recent collectors. Dr. Boulenger informs us that twelve dorsal rays are present in the original type, three of them entirely hidden by the skin.

81. **Psychrolutes zebra** Bean. Plate lxxxv.

Probably rare. One small specimen obtained, about an inch and a half in length.

82. **Gilbertina sigalutes** Jordan & Starks, n. gen. and sp. Plate lxxxvi.

Head 3 in length of body; depth 4; dorsal VIII, 18; anal 14; ventrals I, 3; pectoral 15; eye 6 in head; interorbital 2½; maxillary 2⅕; ventrals 2; pectorals 1; caudal 2¼; base of dorsal 1⅗ in length of body; base of anal 3.

Body rather slender, robust anteriorly, compressed posteriorly, the greatest breadth and depth at shoulders. Head large, the nape slightly produced; mouth large and broadly rounded, oblique, the jaws about equal; maxillary extending to posterior margin of eye, its end buried under the skin of the cheek; eyes placed high, the interorbital space very wide and slightly convex, its width about 2½ times that of the eye; the posterior end of mandible very prominent; bones of head cavernous, largely made up of cartilage; anterior end of preorbital forming a blunt spine over mouth; process of premaxillary prominent; a couple of blunt projections behind each eye; upper part of shoulder girdle projecting, forming a blunt spine on nape above gill-slit; a row of large pores around suborbital ring, and along under part of mandible; no opercular spines.

Head and body covered with a very loose, naked, movable skin; dorsal fin continuous; no notch between spines and soft rays; the spines very slender, the first one inserted over end of opercular flap; the last rays reach to the base of caudal fin; anal lower than dorsal, its origin midway between base of caudal fin and posterior margin of eye, ending at about the same point that dorsal does, but not reaching so far; pectorals long and slender, reaching past front of anal and over half way between their bases and base of caudal fin; they are adnate to the body for the anterior third or fourth of their length; ventrals long, not quite reaching to vent, adnate to the body for half their length; caudal fin rounded.

Color light olivaceous; body and head with innumerable dark points giving the fish a dusky appearance; a large dark blotch across body at the posterior end of the dorsal and anal; a similar spot under pectoral; head uniform dusky, lighter below; belly white, middle of pectoral dark; dorsals dark; lower fins white.

A single small specimen dredged, 1½ inches in length. It is numbered 3129 on the register of the Leland Stanford Jr. University Museum.

This species is the type of a strongly marked genus, distinguished from *Psychrolutes* by the very long dorsal and anal fins and by the form of the mouth. It is named for Dr. Charles Henry Gilbert, who has contributed more than any one else to the knowledge of the fishes of the Northern Pacific.

Family RHAMPHOCOTTIDÆ.

83. **Rhamphocottus richardsoni** Günther. Plate lxxxvii.

Head 2; depth 2; dorsal VII, 13; anal 6; pectoral 14; orbit 6 in head; maxillary 4; snout 3; highest dorsal spine 6⅓; dorsal ray 4; anal ray 4; pectoral 2⅙; ventral 2; caudal 3.

Body short, compressed, the back elevated, its greatest depth just in front of spinous dorsal.

Head large, as long as the rest of the body; snout long and narrow; mouth U-shaped, its gape longer than wide, lips thick, their surface broken up into papillæ; maxillary reaching the nasal spine; lower jaw included; teeth in villiform bands on jaws and vomer, none on palatines; eye placed high, its diameter contained twice in the snout, once and a half in the interorbital; a branched dermal flap, as long as pupil, at tip of the snout; head with two large bony ridges above, continuous with the orbital rim and ending in strong blunt spines at occiput, head deeply concave between these ridges; nasal spine sharp and recurved; a pair of strong spines over the eyes; a sharp spine just above opercle, a blunt one on opercle below flap, and a long sharp one at angle of preopercle; a low bony ridge leads to each of these spines; a long sharp spine on clavicle just behind gill-opening; a blunt bony knob at posterior end of mandible; gill-openings extending upward from upper pectoral ray, their length equal to the length of the snout.

The entire head and body covered with multifid spines, those on head much smaller than the ones on sides; a few simple spines along cephalic ridges; the first dorsal spine covered with spinules, and each dorsal ray has a row on its side; a few spines on the base of the pectoral and anal rays.

Dorsal spines very weak, fitting in a groove in the back; soft dorsal higher than spinous, the tips of the rays reaching the base of caudal fin; anal short, few rayed, reaching slightly beyond soft dorsal: pectorals pointed, their lower rays entirely free, reaching about to the base of the third anal ray: ventrals reaching to ends of pectorals, their origin behind the lower part of pectoral base a distance equal to the length of snout: caudal rounded behind.

Body creamy yellow, with conspicuous irregular dark stripes, edged with black, running obliquely across the body; similar stripes radiating from the eye in all directions, one to end of snout, a triangular one downwards, one running backwards and downwards, to middle of preopercle, then turning upwards and running nearly to occipital spine, two or three short ones above; each of these involving the membrane of eye; 2 or 3 black-bordered dark spots on edge of opercle; a light yellow streak surrounded by black across caudal peduncle, behind which all is bright cherry-red to the end of caudal fin; two similar spots on base of pectoral: top of head crossed with wavy black-edged dark bars; tip of lower jaw black; a line of black spots running along under parts of mandible; fins all bright red, each ray of dorsal with a sharp black spot at its base, a few spots on dorsal spines: anal, pectorals, and ventrals, dark at base.

One specimen, 3 inches in length, collected in a rock pool, on Channel Rocks near Point Orchard, by Miss Adella M. Parker of Seattle: a second specimen, presented by the Young Naturalists' Society. The skeleton of this specimen has been prepared. It shows the following characters:

The posterior end of the prominent ridge, which runs backward from the superior orbital rim on each side, is formed by the epiotic process. It ends in the form of a long "occipital spine;" almost directly under it is the short parotic process.

The post-temporal is short, wide and flat; its upper end is attached to the inner side of the epiotic spine, and for the whole length of its anterior edge, to the skull between the epiotic and parotic processes. From its lower inner surface it sends a wide thin bone, which is firmly fastened to the base of the skull. It bears a backward projecting spine on its lower end, inside of which the supra-clavicle is attached.

Actinosts large, wide and thin, without an opening between them. Subopercle absent; preopercle large, sending a spine backwards; opercle triangular on its lower inner angle, the interopercle is developed and strongly coossified with it; it sends a slender process forward under the preopercle; a projection downward from the posterior end of the articular; suborbital wide, thin and concavo-convex, its convex surface outwards. Skull without basal chamber; vertebræ 10+14.

Family AGONIDÆ.

84. **Aspidophoroides inermis** Günther.

The type from Vancouver Island recorded by Günther.

85. **Bothragonus swani** (Steindachner).

Known only from the type taken near Port Townsend.

86. **Pallasina barbata** (Steindachner).

Taken at Port Angeles by the Albatross.

This species is the type of the genus *Pallasina* Cramer, distinguished from *Brachyopsis* by the long, Syngnathus-like body, and by the presence of a long barbel at the chin. The genus *Siphagonus*, to which Dr. Steindachner refers it, is based on *Agonus segaliensis*, which seems to be a true *Brachyopsis*.

87. **Podothecus acipenserinus** (Pallas).

Very abundant on sand beaches, where it is taken with seines. It reaches a foot in length. Many specimens taken.

Two additional new species of *Podothecus*, presented by the Alaska Commercial Company, collected by Capt. J. G. Blair at Robin Island, in the Gulf of Patience, Saghalien, may be here recorded:

Podothecus accipiter Jordan & Starks, n. sp. Plate lxxxviii.

Head 3⅗ in length; depth 6½; dorsal VIII–9; anal 10; pectoral 15; lateral plates 36; eye 4½ in head; snout 2⅛; second dorsal spine 1⅚; second dorsal ray 1½; third anal ray 1⅗; caudal 1⅘; upper ray of pectoral 1⅐; ventrals 2⅓.

Body elongate, not compressed; head triangular as viewed from above; the mouth wide, entirely inferior, ∩-shaped, the lower jaw shutting behind the upper by a distance equal to half eye; maxillary not reaching quite to anterior orbital rim; distance of anterior edge of upper lip from tip of rostral spines a little more than half eye; teeth in upper jaw almost obsolete; villiform band of teeth in lower jaw, wide in front becoming narrow at sides; vomer and palatines toothless; a patch of thick barbels below snout in front of mouth, the longest equal to vertical diameter of eye, a similar patch at end of maxillary, about equal in length to the shortest on snout; two short barbels on each side of lower lip between symphysis and angle of mouth. A pair of short, sharp, rostral spines, pointing directly forwards; at their base and much wider apart is a pair of spines which point upwards, backwards and slightly outwards; running backwards from these are the ridges that bound the wide groove in which the maxillary process fits; these approach each other behind and end in sharp spines which point backwards and upwards; these spines are midway between middle of eye and the spines behind rostral spines; no median or movable spine at tip of snout; a pair of large spines above posterior third of eye and a pair of larger ones at occiput, these are continuous with the dorsal ridges; a curved ridge running from superior orbital rim and ending in a small spine just above opercle; a small ridge on opercle; preopercle with a large spine; a couple of spines below eye at lower edge of suborbitals, running from them to tip of snout is a ridge along lower edge of preorbitals; it is somewhat irregular but without spines; interorbital space wide and deeply concave, a pair of ridges on each side, converging forwards; supraorbital rim prominent; anterior nostril ending in a short, wide, conical papilla, with a small opening at the apex; no noticeable depression at occiput.

Dorsal ridges converging from the occiput to behind the soft dorsal; they unite on the second plate behind the base of last dorsal ray, this is continued as a single ridge on about 8 plates where it becomes obsolete; the upper lateral ridge follows the course of the lateral line to about the middle of spinous dorsal, where it slants sharply upward and is continued to tail above lateral line; lateral line midway between upper and lower lateral ridges posteriorly; a single spine above base of pectoral indicating an obsolete ridge between the lateral ridges; lower lateral ridge becoming obsolete under pectoral on 2 or 3 plates behind its base; abdominal ridges widest apart behind base of ventrals, uniting directly behind anal base and running simple backwards, becoming obsolete on caudal peduncle; all the ridges with sharp recurved spines, with the exception of abdominal ridges behind part of anal; where the dorsal and anal ridges disappear the caudal peduncle assumes a quadrangular shape, the corners being formed by the spines of the lateral ridges; no row of spines around base of caudal or pectoral.

Fins all very high, origin of dorsal between the fourth and fifth dorsal plates, the fin to base of last spine covering 6 plates, the membrane covering 2½ more; the second and third spines the longest, a membrane connecting the last spine to the body for its whole length; when fin is depressed the ends of the last spines reach to the front of second dorsal; the second dorsal to end of last ray covers 8 plates, the membrane covers one more; the second and third rays are the longest, the last ray is connected to the body for about a third of its length; base of anal covering 8½ plates; the rays are very long and not differing much in length, the last ray not connected to body by a membrane; the fin begins in front of soft dorsal but is about coterminous with it, its rays when depressed reaching past ends of soft dorsal, 6 plates past base of its last ray; pectorals barely reaching to tip of last dorsal spine, the fin pointed above, first and second rays the longest, the lower rays produced beyond the membrane, making a notch in posterior outline of fin; origin of ventrals directly below base of pectoral, their tips reaching 6 plates beyond their base; caudal long and truncated; vent directly behind base of ventrals.

Color light brown above, white below; back with many narrow brown bars placed at irregular distances apart; head with many blended brown spots, one under eye, one on front margin of eye, one or two on top of head, one behind eye, one on preorbital, a similar spot on base of pectoral rays; pectoral dusky. First dorsal with 3 rows of spots across the rays, a very narrow brown border to fin; second dorsal with similar spots, not arranged in rows; anal light above, uniform brown below; ventrals white; caudal fin dark at base with 3 or four dark spots towards middle of fin.

One specimen collected at Robin Island, by Capt. J. G. Blair. It is 8 inches in length.

Podothecus veternus Jordan & Starks, n. sp. Plate lxxxix.

Head $3\frac{2}{3}$ in length; depth $7\frac{1}{3}$; dorsal IX–8; anal 8; pectoral 15; lateral plates 36; orbit $4\frac{1}{5}$ in head; snout $2\frac{1}{5}$; upper rays of pectoral $1\frac{1}{2}$; highest dorsal spine $2\frac{1}{3}$; highest dorsal ray $2\frac{3}{5}$; highest anal ray $2\frac{3}{5}$; caudal $2\frac{1}{2}$.

Body elongate, about as wide as deep anteriorly, much wider than deep posteriorly; mouth inferior, the lower jaw shutting far behind the upper; teeth on jaws, vomer, and palatines obsolete; a few short barbels beneath snout in front of mouth, and at angle of mouth; their length about equal to pupil; bones of lower jaw extensively cavernous.

A pair of short blunt rostral spines pointing directly forwards; at their base and wider apart is a pair of sharp spines curving outwards, backwards and upwards; at the posterior end of the rather wide rostral groove are a pair of small spines pointing upwards and backwards; from their base a pair of diverging ridges run through the interorbital to above posterior margin of orbit. No median or movable spine at tip of snout. A strong spine over eye, and a longer one at occiput; a low sharp ridge on side of head, running from ocular spine and ending in a low spine at upper end of gill-opening; a very low ridge on opercle not ending in a spine; preopercle with a strong spine with a wide keel-like base; a hooked spine below eye on suborbital, from which a ridge runs along lower edge of preorbital to end of snout, below posterior end of rostral groove; on this ridge is a triangular spine pointing backwards; between this and the suborbital spine is an acute outward pointing spine not much widened at its base; interorbital concave, its width equal to the length of the eye, 2 in snout; supraorbital rim prominent. The dorsal ridge of body is continuous with occipital and supraorbital spines, it joins its fellow of the opposite side posteriorly, directly behind the second dorsal, and is continued simple on caudal peduncle; the spines are large and strongly hooked back anteriorly, becoming nearly obsolete posteriorly, only traceable on caudal peduncle by the center of each plate on the median line being slightly produced; spines on lateral ridges with stronger spines near middle of body than anteriorly or posteriorly; two or three blunt spines above base of pectoral, indicating an obsolete ridge between lateral ridges; lateral line at end of pectoral fin running along the upper lateral ridge a short distance, and becoming obsolete anteriorly; spines of abdominal ridge low and blunt, nearly obsolete posteriorly; the ridge joins its fellow of the opposite side directly behind base of anal fin and continues as a single low ridge on caudal peduncle; a small plate before base of each ventral; a median row of three running forward to gill membrane, three on each side of these, a row around base of pectorals. Origin of dorsal behind the fourth dorsal plate; including the membrane behind, it covers 9 plates; one plate between dorsals; the second dorsal covers 8 plates, behind which are 14 plates; the last ray of first and second dorsal and anal, are connected to the body by a membrane; upper ray of pectoral the longest, reaching to below the ninth or tenth spine of dorsal ridge, the lower rays slightly produced beyond the membrane.

Color in spirits, reddish-brown above, light below: narrow, irregular, transverse dark streaks across back and sides; a longitudinal dark bar along each side of base of both dorsals; a dark streak forward from eye; margin of spinous dorsal blackish; soft dorsal with a small spot behind, a dark spot on pectoral rays near their base and some dark bars behind it across rays: anal and ventrals colorless; caudal dusky.

A single specimen collected by Capt. J. G. Blair at Robin Island, about 8 inches in length.

Related to *P. acipenserinus* and *P. gilberti*. It differs from the former in having fewer and shorter barbels, teeth on jaws obsolete, keel and preopercle larger; dorsal ridges without spines posteriorly, and the spines on the preorbital ridge different in shape; from the latter in having the body different in shape, not everywhere deeper than wide, but the reverse posteriorly; anal much shorter and lower; no teeth on jaws, and the spines on preorbital ridge better developed and different in shape.

Allied to *Podothecus* is the genus *Stelgis* Cramer, of which *Podothecus vulsus* is the type. It is distinguished from *Podothecus* mainly by the comparative lack of barbels and by details of armature. We present a figure of the species drawn from the original type of *Stelgis vulsus*, the only specimen yet known. (Plate xc.)

88. **Averruncus emmelane** Jordan & Starks, n. gen. and sp. Plate xci.

Head from tips of rostral spines 4 in length of body; depth 7½; dorsal VIII or IX–8; anal 11; pectoral 14; lateral line 35; orbit 4 in head; snout to tips of rostral spines 3⅛; maxillary 3¾; interorbital 6¼; pectoral 1⅖; second dorsal spine 2⅗; third dorsal ray 2⅓; longest anal ray 2⅗; caudal fin 2.

Body elongate, subcylindrical, the caudal peduncle long and slender, very slightly depressed, about three plates in front of caudal fin it widens slightly and is compressed; belly somewhat prominent, breaking the otherwise straight vertical outline from chin to caudal fin; dorsal outline straight from occiput to caudal fin.

Head as viewed from above almost regularly triangular, the prominent preopercular spines and the snout forming the angles; its dorsal profile irregular, much broken by spines.

Mouth inferior, broadly U-shaped, maxillary reaching just past the vertical from front of orbit; lips thick, covered with short, fine papillæ; upper jaw protractile; teeth small, in villiform bands, on the jaws, vomer and palatines; the distance from the anterior edge of premaxillary to end of the rostral spines is less than half the length of snout; two cirri as long as pupil under rostral spines, anterior lower edge of preorbitals with cirri, a group of 3 cirri on end of maxillary, and a group of 4 or 5 on posterior end of mandible; one on the middle of each branchiostegal ray, these forming a line from isthmus to opercle an area on chin from the mouth to the hyal bones "woolly" with short cirri; 2 or 3 cirri on lower edge of opercle and interopercle. A pair of parallel rostral spines pointing forward, their tips covered with skin; behind them is a deep oval pit, on the anterior outer edge of which are a pair of spines that point upward and outward and are slightly hooked backwards: at the posterior end of the pit are two spines, smaller than those above, and slightly curved backward; no median nor movable spine at tip of snout: a group of four short spines around anterior edge of eye, and one large triangular spine over posterior edge; the interorbital space is deeply concave, with a low sharp ridge on each side of the median line; preopercle very rough with irregular spines and tubercles;

middle of suborbital stay with a strong hooked spine: below the stay, on the naked area, are 2 or 3 plates with spines on their centers; angle of preopercle with a large sharp spine: along the lower edge of preopercle are 3 or 4 blunt spines; a ridge of 4 spines running back from each eye, corresponding with the dorsal keels of body; below this on each side is a ridge, somewhat irregular but not broken into spines, terminating in a spine that points between the dorsal and upper lateral keel of body: a small ridge on upper edge of opercle which does not end in a spine: a few small spines around posterior edge of opercle; a few minute spines along median line of top of head, the upper part of the eye covered with minute prickles. At the occiput is a deep pit, broader and deeper than long, divided by a low ridge through its middle.

Body with four ridges on each side, formed by the body plates, each plate ending in a strong recurved spine, except those of the abdominal ridge, which are smooth; a row of minute spines along median dorsal line from first dorsal to occiput;, small spines following the lateral line; no trace of keels or spines in front of ventrals. The abdominal ridges are widest apart on the belly, they unite on the tenth plate in front of the caudal fin. The dorsal ridges unite on the ninth scale in front of the caudal fin, but the spines continue double to the tail; a row of sharp, small spines around the base of the pectoral and caudal fins.

Dorsal spines slender, the fin highest in front, the second spine the longest, its tip reaching to the base of the next to the last spine when the fin is depressed; third dorsal ray the highest, its tip reaching nearly to the last ray when depressed; the last ray is very short and adnate to the body for the whole of its length. Lower rays of pectoral fins produced, extending beyond the membrane, the longest extending beyond the upper ray of the fin; anal longer and lower than soft dorsal, ending at the same corresponding place: last ray reaching to the fifteenth plate before caudal fin. Ventrals differing in length in the different sexes, reaching from slightly beyond vent to nearly half its length beyond; inserted slightly behind pectorals; caudal fin rounded behind; vent anterior, situated on the tenth plate in front of anal.

Color dark brown, belly white; sides crossed with irregular white bars, giving the fish a mottled appearance, besides dark dashes as though the fish had been bathed in ink (ἐν μελάνῃ); snout black; a black streak along lower edge of preopercle; a black spot on iris above; dorsals light, mottled with black; anal white with dark mottlings, a dark bar across the posterior rays, the tips of all the rays white; ventrals black, abruptly white at tips; pectoral and caudal dark with a white border, a light spot in the center of fins, and many white spots on the rays; a black spot at base of pectoral.

Two specimens collected with a seine near Point Orchard, the largest 7 inches in length. They are in the Museum of the Leland Stanford Jr. University, No. 3135.

This species is the type of a distinct genus, *Averruncus*, allied to *Podothecus*, but with teeth on the vomer and palatines. The lack of the median movable rostral spine separates it from *Odontopyxis*, in which genus the dorsal fins are very small.

89. **Xystes axinophrys** Jordan and Starks, n. gen and sp. Plate xcii.

Head 3½ in length of body; depth 5; dorsal IX–8; anal 10; pectoral 15; lateral line 38; orbit 4 in head; snout to tip of rostral spines 3⅙; maxillary 3⅙; interorbital 3½; pectoral 1½; highest dorsal spine 2½; highest dorsal ray 2; highest anal ray 2¾; length of caudal fin 1⅔.

Body elongate, subcylindrical, deepest and broadest at shoulders; belly prominent; dorsal outline straight from first dorsal spine to caudal fin, curved up anteriorly to occiput. Head very irregular, much broken by large spines; mouth inferior, rather broad, maxillary reaching to the vertical from front of orbit; lips thin, not broken up in papillæ; upper jaw protractile; teeth small, in villiform bands on jaws, vomer and palatines; the anterior edge of premaxillary is directly under the base of rostral spines; a few very small blunt papilliæ behind chin; a barbel at end of maxillary, not half so long as diameter of pupil.

A pair of sharp rostral spines pointing forward and upward; behind these is a pair of curved spines pointing upward, outward and backward; no median spine or movable spine at tip of snout; between these and behind the rostral spines is an almost circular pit, which is entirely occupied by the upper end of the premaxillary process; interorbital wide and concave, a slight median ridge running from the rostral pit to a point above pupil, on each side of which is an outward curved ridge ending in a minute spine; over each eye is the largest spine on the head or body, the large triangular orbital spine, its base occupying nearly the whole space above eye; it is sharp, compressed and strongly hooked back; on the anterior part of its base is a small, sharp, preorbital spine, pointing upward; a series of minute spines running medially along the top of the head and body from a point between the orbital spines to the first dorsal spine; on each side of these are two large blunt spines, with the traces of a smaller one between them, they are continuous with the dorsal keels of body; farther down and continuous with the upper lateral keel of body is a ridge broken up into 4 irregular spines, larger than the body spines; 4 triangular spines on edge of preopercle, the upper one the largest; a very irregular ridge running from upper preopercular spine, under eye, to snout; a ridge on upper part of opercle.

Body with 4 ridges on each side, formed by the scales, each of which ends in a spine; traces of a ridge between lateral ridges; the spines on abdominal ridges as sharp as those on rest of body; a Y-shaped ridge of spines in front of ventrals, the forks toward the ventrals and the base ending at gill-membrane; a raised area between ventral fins, running from their base to opposite their tips, which is entirely covered with small prickles; the anus is in the posterior end of this; the dorsal and abdominal ridges coalesce with their fellows of the opposite side, but they come together so gradually that it is impossible to tell exactly where they unite, as the spines continue distinct to the caudal fin. Small spines covering the outer part of the base of the pectoral; a ring of spines around caudal base; a few minute spines on eye above pupil; occiput abruptly lower than body, but scarcely forming a pit, as the body is about level behind it.

Spinous dorsal highest in front, the second spine reaching to base of last spine when fin is depressed; the dorsal rays subequal in length, the last not shortened and not adnate to body; last ray reaching to the tenth plate before caudal fin; pectoral fin posteriorly rounded in outline, the lower rays not produced; it reaches to the second plate before anal fin; ventrals small, reaching just past vent; anal longer and lower than soft dorsal; dorsal and anal ending at the same corresponding place; caudal fin rounded behind.

Color, in spirits, gray, with 7 or 8 dark cross-bars; head uniform gray with the exception of a dark spot at occiput; belly dusky; dorsals somewhat mottled; anal black, with a white spot near its middle; pectorals white, with a large black spot on base of rays; ventral black, abruptly white at tips; caudal black, edged with white.

One specimen brought up in the dredge, 1½ inches in length. It is in the Leland Stanford Jr. University Museum, number 3130.

This species seems to represent a new subgeneric or generic type, allied to *Averruncus*, distinguished by the supraocular spine and by the subequal rays of both dorsals, the last of each not adnate to the body.

90. **Xenochirus triacanthus** Gilbert. Plate xciii.

Rare; brought up in the dredge in company with *Odontopyxis trispinosus*. One specimen obtained, 3½ inches in length. In this young example, here figured, the lower rays of the pectoral are not produced.

91. **Odontopyxis trispinosus** Lockington.

Abundant in deep water; the most common species brought up by the dredge. Length 4 inches. In this genus and in *Xenochirus* there is a movable spine or long plate on median line at tip of snout.

Family CYCLOPTERIDÆ.

92. **Lethotremus vinolentus** Jordan and Starks, n. sp. Plate xciv.

Head 2¼ in length; depth 2¼; dorsal V–7; anal 6; eye 3 in head; snout nearly 4; maxillary 2½; interorbital 2⅓; ventral disk 1⅓; height of spinous dorsal 2⅓; length of pectoral 2¾.

Body short and thick, broadest at head, deepest in front of first dorsal spine, abruptly compressed at vent; back somewhat elevated.

Mouth terminal, oblique, the jaws about equal; snout very blunt; maxillary reaching slightly past the vertical from front of eye; teeth in narrow villiform bands; teeth on vomer (the specimen is so small, we cannot be sure of the palatine teeth); eye large, set high in the head, its diameter greater than the length of the snout; interorbital wide and flat, the diameter contained 1½ times in the width; gill-opening oblique, about as wide as eye and on a level with eye; disk ¼ longer than broad, its length about equal to distance from gill-opening to anterior edge of eye.

Skin thick; head and body nearly naked, a few spines scattered over it; spinous dorsal with 3 or 4 small spines, a minute simple spine in front of eye and 2 or 3 above it; 4 multifid spines following the curve of back, under spinous dorsal, and 1 under the front of second dorsal, 2 similar spines on each side of nape, just above opercles; 2 on edge of opercle and 3 on edge of preopercle; an irregular row of 6 running from above base of pectoral to front of anal fin, and a couple of small ones behind gill-opening: body otherwise naked. All the above spines, with the exception of those noted as simple, are long sharp spines in groups of from 3 to 6 with a common base, generally the length of each spine exceeds the length of the base. No lateral line.

Spinous dorsal reaching to the first ray of soft dorsal when fin is depressed, higher than soft dorsal; anal and soft dorsal similar; caudal small, truncate or slightly rounded; pectorals very short, reaching to the posterior edge of ventral disk.

Color bright wine-red, slightly lighter below, without markings, sides dusted over with very small dark points; spinous dorsal dusky; other fins colorless. Colors disappear in alcohol.

One specimen brought up from deep water in the dredge, ½ inch in length. Numbered 3131 on the register of the Leland Stanford Jr. University Museum.

This species seems to belong to the genus *Lethotremus* Gilbert, MS. From *L. muticus*, type of the genus, it is distinguished by its few-rayed fins and by its scanty prickles.

93. **Eumicrotremus orbis** (Günther).

One specimen of this interesting fish taken, 2 inches in length.

Family LIPARIDIDÆ.

94. **Neoliparis greeni** Jordan and Starks, n. sp. Plate xcvi.

Head 3⅘; depth 4; depth at disk 5; dorsal VI–34; anal 30; pectoral 35; caudal 15; eye small, about 10 in head; snout 2¾; longest pectoral ray 1¾; disk 2½; longest dorsal ray 2⅙; longest anal ray 2⅙; caudal 1¾.

Body elongate, posteriorly compressed; profile undulate, over snout blunt and rounded, depressed over eyes, well rounded from eyes over occipital region. Skin thin and exceedingly loose, nearly to the end of the dorsal and anal rays.

Jaws equal; maxillary extending to posterior margin of eye; teeth small, nearly simple, depressible and blunt, slightly hooked back, arranged in oblique series, those in the front running nearly straight in, but towards the sides of the jaw they grow more and more oblique till they are nearly parallel with the jaw at the sides; superior pharyngeal teeth conical and sharp, slightly longer than the teeth in the jaws, arranged in a single round patch on each side; inferior pharyngeals separate, with small teeth. (Teeth probably tricuspid in young specimens.)

Posterior nostrils in a short wide tube; cheeks well rounded: gill-rakers short and thick, no longer on the outer side of the first arch than on the other arches, fourth arch not free; gill-slit short, its length contained about 3 times in head, its lower edge extending in front of pectoral to about the third ray; opercles with a blunt spine which is covered by the skin.

Dorsals two, connected by a low membrane; first dorsal about twice as high as anterior part of second dorsal; the first rays of pectorals inserted under eye and in front of disk: the anterior rays short, graduated to the sixth ray, which is about 4 times longer than the first, the next few rays again short and gradually lengthening posteriorly; posterior rays ⅓ longer than anterior, fin broadly rounded behind: ventral disk nearly round, its posterior edge reaching the vertical from gill-slit; its distance from tip of lower jaw 1⅓ times its length: caudal truncate or slightly rounded: vent under ends of pectorals.

Color, in alcohol, uniform brown, breast and lower parts of head creamy, fins slightly darker. When fresh the sides were blotched with pinkish.

The type of this species is a specimen 10 inches long, in the Leland Stanford Jr. University Museum, number 3019. It was collected in the Harbor of Victoria by Mr. Ashdown H. Green, of Victoria, President of the Natural History Society of that town.

95. **Neoliparis floræ** Jordan & Starks n. sp. Plate xcvi.

Head 3⅗ in length of body: depth at ventral disk 5½; depth under middle of soft dorsal 4½: dorsal VI–27: anal 21 to 23; caudal 15; pectoral 30; eye 7 in head; interorbital space 2¾: maxillary 2½: pectoral 1⅗: ventral disk 2¼.

A small specimen collected at Waadda Island, Neah

Bay. No. 3133, Leland Stanford Jr. University Museum.

Body moderately elongate, much compressed posteriorly, about as wide as deep anteriorly, its greatest depth under middle of soft dorsal where the back is elevated. Flesh very firm, the body retaining its form, the skin loose but not flaccid.

Head small, the nape not produced; mouth moderate, the maxillary extending to below the anterior margin of orbit; jaws subequal; teeth tricuspid, arranged in series which are nearly transverse on middle of jaws, becoming more and more oblique towards the sides, the outermost series nearly parallel with the sides of jaws; nostrils ending in a short wide tube; gill-opening short, extending downward to about the fifth pectoral ray, its length about half interorbital space; opercle ending in a flap, which extends over middle of gill-opening; ventral disk slightly longer than wide, its distance from tip of lower jaw once and a half its length; vent equidistant from posterior edge of ventral disk and front of anal; skin thick and not very loose.

Origin of spinous dorsal a little in front of the vertical from vent, its distance from snout 3 in length of body; anterior part of dorsal separated by a notch; origin of anal about equidistant from snout and base of caudal fin; some of the lower rays of pectoral produced forming a notch in the lower posterior margin of fin, the fourth to the tenth of the upper rays the longest, forming a rounded point behind, extending slightly past the vertical from snout; dorsal and anal scarcely connected with the caudal; caudal long and slender, rounded behind.

Color a uniform dark olive green, under parts white, a light streak medially along back from dorsal to occiput, a light spot over opercle; pectoral light at base, dusky behind; other fins colored like the body; lips white.

This small specimen taken in a rock pool on Waadda Island, Neah Bay. Length 2 inches.

A second specimen, about 5 inches long, is in the Museum of the California Academy of Sciences. It was collected off San Francisco by Mr. H. D. Dunn. In this specimen, the dorsal rays are VI–27; anal 25; pectoral 30; caudal 15; teeth blunt. Flesh firm; form and color of the young specimens above described. The species is named for Mrs. Flora Hartley Greene, Assistant Curator of the Museum of Leland Stanford Jr. University.

In the Museum of the California Academy is the only specimen we have ever seen of the rare *Neoliparis mucosus* (Ayres), likewise obtained at San Francisco by Mr. H. D. Dunn. We here present a description and figure of this specimen (No. 360):

Neoliparis mucosus (Ayres). Plate xcv.

Head 4 in length; depth 4⅓: dorsal VI–26; anal 26; pectoral 29; caudal 12: eye 7 in head; snout 3; ventral disk 1½; pectoral 1⅗; longest dorsal ray 2: highest anal ray 2; caudal 1¼.

Body not greatly elongate, rather robust, compressed posteriorly, holding its width well past middle of body; head short and thick, broader than body, ⅓ longer than broad, its length 1⅗ times its depth; mouth small, truncate, its cleft almost entirely anterior, scarcely extending laterally; end of maxillary buried under the skin, barely reaching to eye: nostrils not ending in tubes; lower jaw slightly the shorter: teeth sharp, tricuspid, the middle cusp much the highest and longest, arranged in nine oblique series in both jaws, becoming more and more oblique toward the sides: interorbital space moderately wide, about 3½ in head, a little convex: gill-slit not extending below upper edge of pectoral, its length about 1½ times eye and 3 in ventral disk.

Pectoral broadly rounded when spread, its notch comparatively very shallow, its tip reaches past vent but not to notch in dorsal; ventral disk large, slightly longer than broad, its posterior margin almost midway between its anterior and front of anal, its anterior margin half its length from chin; dorsal with a shallow notch; origin of fin over posterior margin of ventral disk, its longest rays in its posterior half; origin of anal a little nearer snout than base of caudal, the last four or five rays rapidly shortened, making the fin truncate behind; dorsal and anal scarcely joined to caudal; caudal long and slender, rounded behind.

Color olive brown, light below; indistinctly mottled; dorsal and anal darker at their margins; pectorals uniform dark brown; caudal light, with indistinct cross-lines; lips dark.

Here described from the only specimen known to us, five inches in length; from near San Francisco. It is now in the collection of the California Academy of Sciences (No. 360). Collected by H. D. Dunn, off San Francisco.

96. **Neoliparis callyodon** (Pallas).

Obtained by the Albatross at Port Angeles.

This is the species figured by Mr. Garman (monograph of the *Discoboli)* as *Liparis mucosus.* His description seems, in part at least, to have been drawn from *Neoliparis floræ.* The latter has larger gill-openings than either *Neoliparis mucosus* or *N. callyodon.*

Neoliparis callyodon is extremely abundant about the Aleutian Islands. The coloration, form of mouth, small gill-opening and the number of fin-rays all point out this as the original *callyodon* of Pallas.

The following is an analysis of the species of *Neoliparis,* as far as known:

a. Gill-opening very narrow, almost entirely above base of pectoral, the lower edge not below third pectoral ray.

  b. Anterior nostrils with distinct tubes.

    c. Dorsal rays about 30; anal rays about 24; form robust; ventral disk 2¼ in head; color brownish, clouded or banded. North Atlantic on both coasts, south to Cape Cod. *montagui.**

    cc. Dorsal rays 34 to 36; anal rays 25 to 28; lower jaw included; form rather elongate, the head depressed; ventral disk 2⅙ in head; color pale, irregularly dotted with darker, sometimes plain brownish. Alaska, south to Puget Sound. *callyodon.*

  bb. Anterior nostrils with a raised rim, and without distinct tubes; head short, blunt, 4 in length; ventral disk very large, 1½ in head; snout blunt; mouth very short, its cleft almost entirely anterior, the maxiliary scarcely reaching eye. Dorsal rays 32; anal 26. Color plain rosy or brownish, not spotted. Off San Francisco. *mucosus.*

aa. Gill-opening rather large, its base opposite 4 or 5 upper rays of pectoral; body deep posteriorly; nostrils with raised rim, but without distinct tubes; ventral disk moderate, 2¼ to 2½ in head; head about 3¾ in body, depressed above; cleft of mouth broader, partly lateral, nearly 3 in head; color plain brownish or reddish.

    d. Dorsal rays VI–27; anal 21 to 23; pectoral 30; flesh firm. Puget Sound to Monterey. *floræ.*

    dd. Dorsal rays VI–34; anal 30; pectoral 35; flesh lax. Puget Sound. *greeni.*

97. **Liparis cyclopus** Günther. Plate xcvii.

Head 4⅙; depth 4½; dorsal 34; anal 29; pectoral 30; caudal 12.

Body much depressed and rather broad anteriorly, deep and much compressed posteriorly; head a third longer than broad and a third broader than deep. Flesh much more firm and the skin less lax than in most species of *Liparis.* Opercles with a rather strong spine concealed by the skin; mouth rather large, terminal; jaws subequal; teeth small, tricuspid, in broad bands; eye small, 6 in head; snout 3, flattish and broad above; interorbital space 4⅔ in head; ventral disk oval, 2⅓ in head, its anterior edge half the length of the eye behind postorbital margin; gill-opening moderate, 3½ in head, extending downward to the third or fourth ray of pectoral. Dorsal fin low, continuous, not joined to caudal, beginning slightly before anal, on a vertical with vent; vent midway between edge of ventral disk and front of anal. Pectoral fin emarginate, the upper lobe 1⅗ in head, the lower 2, the shortest intervening rays 3. Anal long and low, barely joined to caudal. Caudal 1½ in head.

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* *Liparis montagui* Donovan.

Color olivaceous, darker above; body and pectoral fin finely speckled with olive brown; fins dotted; bases of the fins paler than their tips; belly white.

Two specimens 4½ inches long, in excellent condition, taken in Elliot Bay, near Seattle, were received from the Young Naturalists' Society. They are numbered 3126 in the register of the Leland Stanford Jr. University Museum. This species, not been previously recognized since its original description, is recorded by Dr. Gilbert from Unalaska.

98. **Liparis dennyi** Jordan and Starks, n. sp. Plate xcviii.

Head 3⅗ in length of body; depth 4½; dorsal 39; anal 30; pectoral 36; caudal 12; eye 8 in head; maxillary 2⅕; snout 2¾; gill-opening 2⅖; upper pectoral lobe ⅓; lower lobe 1½; intervening rays 2¼; ventral disk 2⅓; highest dorsal rays 2⅖; highest anal rays 2⅖; caudal rays 1¾.

Body moderately elongate, much compressed posteriorly, slightly so anteriorly; head moderate, the cheeks and nape prominent. Mouth wide, with little lateral cleft; maxillary extending to below the anterior margin of eye, its end covered with the skin of the head; the lower jaw slightly the longer; the teeth tricuspid, those on the inner part of jaw largest, arranged in about 14 series in each jaw; series nearly transverse on middle of jaw, becoming more and more oblique towards the sides, where they are nearly parallel with the sides of the jaws; interorbital wide, slightly concave; nostrils ending in very short, wide tubes, the posterior over the anterior margin of eye, the anterior in front of it a distance equal to the diameter of eye; opercle ending in a short, wide spine covered with skin; it is situated slightly above the middle of gill-opening; gill-opening running from about the eleventh pectoral ray to a level with the eye.

Origin of dorsal slightly behind base of pectoral, its distance from the snout $3\frac{1}{5}$ in length of body, its anterior rays short, gradually lengthening posteriorly, the rays from the anterior third to near the end about equal, the last ray abruptly shortened, forming a slight notch where the fin joins the caudal; posterior two-thirds of caudal free above; anal similar to dorsal, about the same height, its origin nearer snout than base of caudal, about under the base of the tenth dorsal ray, posteriorly it is longer than the dorsal, joining the caudal at about half its length; ventral disk nearly round, its distance from tip of lower jaw $1\frac{1}{3}$ in its diameter, 1 in distance from vent, 2 from first anal ray; vent midway between front of anal and edge of disk; upper lobe of pectoral broadly rounded, reaching to two-thirds of the distance between vent and front of anal; lower lobe long, reaching nearly to vent; caudal long and slender, rounded behind. Skin very thin and loose on body and head, covering the anterior parts of dorsal and anal, attached at about the middle of rays posteriorly and covering the base of caudal rays.

Color light brown, lighter below, thickly covered with minute brown points, which form spots and mottlings on sides; upper part of head dark, lips spotted with brown; dorsal and anal dark brown, slightly mottled with lighter; pectoral light, with irregular brown spots and bars running across it. Caudal dark brown, mottled at base, two light bars crossing it towards its end, leaving a narrow posterior margin of brown.

The type specimen, 8 inches in length, was collected in Admiralty Inlet by the Young Naturalists' Society and presented by them to the Leland Stanford Jr. University. The species is named for Mr. Charles L. Denny, of Seattle, in recognition of his active and intelligent interest in the natural history of Washington.

99. **Liparis fucensis** Gilbert.

Taken in the Straits of Juan de Fuca by the Albatross. Locally abundant. This seems to be the species described and figured by Mr. Garman (Monograph of the *Discoboli*), under the erroneous name of *Liparis calliodon*. It will be described by Dr. Gilbert in the current number of the Proceedings of the United States National Museum.

100. **Liparis pulchellus** Ayres.

Rather rare. Three or four small specimens brought up in the dredge.

The following analysis will serve to distinguish the North American species of *Liparis*:

a. *Liparis.* Vertebræ in moderate number, about 39; dorsal rays about 35; anal rays 27 to 30.

- *b.* Gill-openings very narrow, entirely above base of pectoral; pectoral rays from 34 to 37; head a little shorter than broad, and a little longer than deep; dorsal and anal slightly joined to caudal; caudal narrow, its rays 12. North Atlantic, south to Cape Cod. *liparis.*
- *bb.* Gill-openings broad, the lower part considerably below base of upper ray of pectoral.
  - *c.* Pectoral rays 30; head low, flattish, a third longer than broad, a third broader than deep; jaws subequal; dorsal free from caudal, which is slightly joined to anal; caudal narrow, of 12 rays. Puget Sound to Unalaska. *cyclopus.*
  - *cc.* Pectoral rays 41 to 43; head short, not quite as wide as long; caudal 15 to 20; the dorsal and anal slightly joined to its base. Puget Sound. *fucensis.*

aa. *Careliparis* Garman. Vertebræ about 46; dorsal rays 40 to 44; anal rays 35 or 36; dorsal and anal largely joined to caudal.

- *d.* Pectoral rays 35 or 36.
  - *e.* Gill-opening small, its lower edge not below first ray of pectoral; nostrils small, the tubes short or absent.

f. Fins plain, not distinctly mottled or barred; body robust, its color plain brownish or with dark spots. Coasts of Greenland. *tunicatus.*

ff. Fins more or less mottled or barred, body moderately elongate; lower rays of pectoral rather short, not half head, not reaching beyond ventral disk; body mottled, usually with concentric rings. Aleutian Islands to Eastern Siberia. *agassizii.*

ee. Gill-opening rather large, extending downward to about fourth ray of pectoral; nostrils with short tubes; lower lobe of pectoral long, reaching much beyond disk, nearly to vent; color brown, the body and fins mottled and clouded. Puget Sound. *dennyi.*

dd. Pectoral rays 42; gill-opening large, its lower edge below upper part of pectoral; body robust; surface covered with round yellowish spots. Aleutian Islands. *cyclostigma.*

aaa. *Actinochir* Gill. Vertebræ about 52; dorsal rays 45 to 48; anal rays 38 to 40; pectoral rays 34 to 37; dorsal and anal largely joined to caudal; gill-opening large, about one-third its length before pectoral; anterior nostril tubular.

g. Head broad, flattened above; body rather elongate; skin usually with wavy, concentric longitudinal streaks, sometimes spotted. Unalaska to Monterey. *pulchellus.*

gg. Head high, boldly rounded, with prominent nape; color olivaceous, clouded and dotted, but without wavy streaks. Coasts of Greenland. *major.*

Family BATHYMASTERIDÆ.

101. **Ronquilus jordani** (Gilbert). Plate xcix.

Not common; occurring in deep water. Reaches a length of 8 inches. A fine specimen presented by the Young Naturalists' Society.

The genus *Ronquilus* is distinguished from *Bathymaster* by its scaly cheeks, enlarged scales on lateral line, and especially by its increased number of simple rays or spines in the dorsal.

Family GOBIIDÆ.

102. **Gobius nicholsi** Bean.

Not rare about Vancouver Island. Not taken by us.

103. **Lepidogobius lepidus** (Girard).

Three specimens dredged, the largest 4 inches in length.

104. **Gillichthys mirabilis** Cooper. Mud Fish.

Not common this far north. Found in the mud in lagoons. No specimens taken by us.

105. **Quietula y-cauda** (Jenkins & Evermann).

This little goby was taken in Saanich Arm, Vancouver Island, by Jordan & Gilbert. One of the two specimens taken from the stomach of *Hexagrammus hexagrammus* and recorded as *Gobiosoma ios* belongs to it. The other is the type of the latter species. This species is the type of the genus *Quietula* Jordan & Evermann, distinguished from *Gillichthys* by the presence of dermal flaps on the shoulder girdle.

106. **Clevelandia ios** (Jordan & Gilbert). Plate c.

The original type of this species was obtained from the stomach of *Hexagrammus hexagrammus*, in Saanich Arm, by Jordan & Gilbert, in 1880. It was not in good condition and the description is defective. Two specimens were dredged near Seattle by us. A description is here appended:

Head 3½ in length of body; depth 6; D. V–16; A. 14; eye 6½ in head; maxillary 1⅘; pectoral 1⅗; ventrals 1⅞; caudal 1⅓; base of soft dorsal 3 in length of body; base of anal 3½.

Body long and slender, compressed, the back not elevated; caudal peduncle moderately wide. Head long, profile steep to within a short distance of the front of the eye, thence horizontal. Mouth very large, not very oblique, the maxillary projecting to opposite the middle of the cheek; jaws subequal; teeth in narrow villiform bands, eye small, longer than wide, set high in head; interorbital space narrow, about as wide as eye. Body covered with very small cycloid scales, impossible to count. Spinous dorsal well separated from soft dorsal, the spines slender; soft dorsal the higher, its origin a little nearer base of caudal fin than tip of snout; anal about equal to soft dorsal in height, its origin a little behind first dorsal ray, nearly coterminous with soft dorsal; ventrals inserted slightly behind pectorals, reaching midway between their base and front of anal; caudal short, its end rounded.

Color light olivaceous, the cheeks and sides with many dark points which form mottlings; snout dark; a dark spot on upper part of opercle; top of head black; dorsals pale, with three or four dark lines running across the rays; some dark spots on base of anal; pectorals crossed with dark wavy lines; caudal with about five irregular cross-bars.

Two specimens obtained, each 2 inches in length.

Family BATRACHIDÆ.

107. **Porichthys notatus** Girard.

Very common in shallow water. It attaches its eggs to the rocks just above low-tide mark, and watches them till they hatch and the young are quite well matured. The young fasten themselves to the rocks by means of a ventral disk, which soon disappears. It makes a peculiar grunting noise when disturbed. It reaches a length of over a foot. Several specimens taken.

Apparently the type of *Porichthys margaritatus* Richardson was the tropical species since described as *Porichthys nautopædium*. The name *margaritatus* should not be used for the northern form.

Family GOBIESOCIDÆ.

108. **Caularchus mæandricus** (Girard).

Very abundant under the rocks between tide marks. It feeds on small shells and crustacea. A large number of specimens obtained at Neah Bay and in the vicinity of Seattle: the largest 4½ inches in length; said to reach a length of 6 inches.

Specimens from Neah Bay varied from light olive to bright cherry-red.

This species has 13 + 19 = 32 vertebræ. The species referred to *Gobiesox* have, so far as known, 10 + 16 = 26. This increased number, associated with its northern distribution, may define the genus *Caularchus*.

Family XIPHIDIONTIDÆ.

109. **Bryostemma polyactocephalum** (Pallas).

This species has been referred to the genus *Chirolophis (Blenniops)*. It, however, differs from the latter in the entire absence of the true or median lateral line, and may be made the type of a distinct genus, for which we suggest the name of *Bryostemma*. In *Bryostemma*, as in *Chirolophis*, there is a short series of large pores above the pectoral.

The following is a description of our specimen from Seattle:

Head 6½; depth 6; D. LXI; A. 61. P. 14. V. 1, 3. Fifteen pores above pectoral.

Body elongate, much compressed, covered with small, smooth, imbedded scales. Head very short, blunt in profile; mouth short, terminal; lower jaw heavy, projecting, its lip with two small cirri; teeth subequal, small, bluntish, close set, in one row in each jaw; eyes 4 in head, near together; snout 4; supraorbital cirri, 2½ in head; interorbital space with two large superciliary cirri; top of head and nape covered with series of erect cirri, the longest nearly as long as eye; about 15 minute cirri along dorsal edge of lateral pores, one on each pore. Rows of pores running around eye, under preopercle, and along entire length of the short lateral series; about 15 in lateral series, which is 2 in length of head; gill-rakers not developed; gill-membranes not joined to the isthmus. Dorsal fin beginning over pectoral and running to caudal; anterior rays fringed with fleshy cirri; first ray, including cirri, 2 in length of head; anal beginning close behind vent and running to caudal, lower than dorsal; vent about ⅓ distance from tip of snout to tip of caudal; distance from base of ventral to vent 4¾ in length of body; pectoral fin but little shorter than head, its breadth at base not half its length.

Color, in spirits, pale brownish, with about 13 dark blotches along dorsal and anal fins; more distinct on dorsal; a black spot on fourth to sixth dorsal spines very distinct; a very faint spot on anterior part of anal; a few dark markings about head and nape. Cirri mostly pale.

One fine specimen, 6½ inches long, from Point Orchard, near Seattle. Collected by Prof. O. B. Johnson.

This species seems to belong to *Bryostemma polyactocephalum*. As figured by Mr. Nelson, the latter species seems to differ in the absence of the lateral pores and in the much shorter and broader pectoral fin; the proportions of the body before the vent are also different.

A number of young specimens collected by the Albatross in Alaska seem to belong to the same species. These are more elongate and less compressed, the body much mottled and vaguely barred, the ventral fins chequred in fine pattern; head sand color; a black blotch on fourth to sixth dorsal spine; anterior dorsal spines little elevated and with few fringes; sides of head with few cirri, except in one specimen in which the cheeks are covered with cirri densely matted. Evidently the species is very variable.

110. **Bryostemma nugator** Jordan and Williams, n. sp. Plate ci.

Head 5½; depth 5½; dorsal LIV; anal 41; ventral I, 3; pores of lateral series 25.

Body elongate, formed as in *Pholis*, less compressed than in *Bryostemma polyactocephalum*, covered with small, smooth, imbedded scales. Head short, very obtuse, almost truncate; top of head from nostrils to near front of dorsal covered with fleshy cirri, much smaller than in *Bryostemma polyactocephalum;* only two or three small ones extending on first dorsal spine; supraorbital cirrus short, 4 to 5 in head; two small cirri placed at the sides of snout, with a larger median one behind them, forming a triangle; jaws equal; mouth horizontal, the angle extending to below pupil; eyes small, 4 in head; snout very short, almost vertically truncate, ⅔ of eye; teeth of both jaws subequal, short, bluntish and close set. Lateral series short, 7½ in length of body, concurrent with the dorsal outline of body. A line of pores begins in front of eye on a level with pupil, runs under eye and to a level with pupil again, then back to and along the entire length of the short lateral series. Gill-rakers not developed; gill-membranes free from isthmus. Vent ⅓ distance from tip of snout to tip of caudal; distance from origin of ventral to anus 4½ in length of body. Pectoral fin 5½ in body, as long as head. Dorsal fin beginning in front of the pectoral, highest along the posterior half; the longest spine, 2⅔ in head, the fin higher than anal; dorsal slightly joined to caudal; anal separated from caudal; caudal rounded, 1⅖ in head; first dorsal spine 4½ in head, its surface with 2 or 3 small cirri.

Color of one specimen, probably male, dark brown, with 13 pale cross-bars along back, extending on dorsal fin; along sides these become obsolete; on belly they become increased in number and broadened below; dorsal fin with 13 large, very distinct, black ocelli, with yellowish rings, one between each pair of the pale blotches: anal with about 7 small blackish spots at base on posterior part, the fin otherwise nearly plain; caudal faintly barred with light and dark; pectorals pale, with two dark pale-edged oblique bars before them; sides of head with irregular dark vertical bars, one of them forming an inverted λ below eye, this and others extending across lower jaw; cirri mostly black.

The other specimen, probably the female, has the body nearly plain brown, the dorsal with but 4 ocelli, the anterior nine being replaced by dark bars on the fin; anal with dark oblique cross-bars; pectorals barred with black. Markings on head more sharply defined, coloration otherwise similar. This second specimen is 4¾ inches in length; the other, 4.

These two specimens were taken near Seattle and presented by the Young Naturalists' Society. They are numbered 3134 on the register of the Leland Stanford Jr. University Museum.

Three additional specimens of *Bryostemma nugator* were taken by Mr. Starks in rock pools on Channel Rocks. The life colors of these were as follows:

Color, dark red above, orange-brown below, belly cream color; sides below with cream-colored cross-bars, wider than eye, running from the axis of body downward and fading into the general color below; a λ-shaped mark downwards from eye, across branchiostegals to isthmus, a similar mark behind eyes, across edge of preopercle this last sometimes broken up and chain-like; top of head dark: snout light: 2 oblique dark bars at base of pectoral: dorsal with 12 or 13 sharp dark brown spots as large as eye, edged with bright red, these arranged regularly along the whole length of fin: pectorals and caudal bright red, with wavy irregular brown lines running across the rays: anal red, with dark brown bars as wide as the interspaces running obliquely downwards and forwards: ventrals light brown.

111. **Pholis ornatus** (Girard).

This blenny is extremely abundant in Puget Sound, where many specimens were taken. It is found under rocks between tide marks, reaching a length of a foot. No specimens were found at Neah Bay. The species varies much in color, being typically yellowish-green with dark markings, but varying to brown or cherry red with the markings faint or obsolete. One specimen is notably different in color: Body purplish red, lighter on the belly; two conspicuous black-bordered white spots on front of dorsal; a light streak bordered with black from eye to nape; pectorals one-fourth shorter than in the others. Dr. Gill tells us that the generic name *Pholio Scopoli* is equivalent to the later *Murænoides*.

112. **Apodichthys flavidus** Girard.

Common in shallow water among the kelp. It varies from bright green to red, orange or violet. Two specimens belonging to the green form (var. *virescens*) were taken by us in Puget Sound; the larger 10 inches in length, the smaller 3 inches. These differ in color from the typical examples. The large one is a bright grass-green, mottled with light gray; a series of blended white spots, as large as eye, along the axis of body from the pectoral fin to the middle of caudal peduncle; belly with many similar spots smaller in size and somewhat sharper in outline; a row of conspicuous black spots, irregular in size, shape and position, along back at the base of dorsal spines; a black line as wide as pupil from nape to eye, a similar line from eye to posterior end of maxillary; a faint light streak across cheek posteriorly; cheek and base of pectoral dusted with fine dark points.

The small one is bright green without distinct markings on body; a silvery bar, running posteriorly from tip of snout through eye, across cheek, to the middle of opercle; no bar downward from eye to maxillary, or from eye to nape as in the large one.

113. **Xererpes fucorum** (Jordan & Gilbert).

Recorded by Jordan & Gilbert as rather rare on Waadda Island. No specimens obtained by us. The new genus *Xererpes* Jordan & Gilbert is distinguished from *Apodichthys* by the small anal spine, which is not grooved in front.

114. **Anoplarchus atropurpureus** (Kittlitz).

Taken at Neah Bay and in the vicinity of Seattle. Abundant under rocks, above low tide mark, in company with *Xiphidion xiphistes* and *Pholis*. It reaches a length of 8 inches. These specimens are scaled on the posterior half of the body only, which is probably true of the genus as a whole.

115. **Xiphistes chirus** (Jordan & Gilbert).

The most common blenny in Puget Sound, where we obtained specimens in abundance. At Neah Bay *Xiphidion mucosum* and *rupestre* were found. We found neither of these in the vicinity of Seattle. Variable in color, running from dull brown to bright red. This species is the type of a distinct genus, *Xiphistes*, distinguished from *Xiphidion* by the well-developed pectoral.

116. **Xiphistes ulvæ** Jordan & Starks, n. gen. and n. sp. Plate cii.

Head 8 in length of body; depth 10; dorsal LXXIV; anal III, 48; eye 5 in head; maxillary $2\frac{3}{4}$; pectoral $3\frac{1}{2}$.

Body eel-shaped as in the related species *X. chirus;* head short; mouth small, oblique, maxillary extending to below posterior margin of eye; jaws subequal, with canine teeth; 4 enlarged canines in front of lower jaw; teeth in upper jaw gradually enlarged from behind forwards; eye moderate, equal to length of snout; interorbital space prominent, sharply convex, narrower than width of eye; nape not constricted.

Five mucous canals radiating downwards and backwards from eye, not reaching to edge of preopercle; the branches running upwards from upper lateral line ending on the membrane of dorsal, the lower lateral line not connected with the abdominal line. Lateral line otherwise as in *Xiphistes chirus.* Origin of dorsal at a distance behind nape equal to distance from nape to middle of eye; the fin posteriorly barely connecting with caudal, anal with 3 spines, its origin about a head's length nearer snout than base of caudal, connected with caudal posteriorly; pectorals equal in length to snout and half eye, slightly shorter than caudal; caudal rounded, fan-shaped.

Color olive-green above, very bright green below; sides along middle and lateral line posteriorly, with conspicuous white spots, half as large as pupil, each with a black spot before and behind it; a black streak from tip of snout, through eye, to nape, a streak starting from eye behind quickly fading out; dorsal darker than body, unmarked; the anterior third of anal green without markings, behind this, faint cross-bars of brown appear, these grow broader and darker posteriorly; caudal olive green with a light bar across base; pectorals green without markings.

One specimen obtained on Waadda Island, Neah Bay. It was found high on the rocks, among algæ just below high water mark. Length 5 inches.

This species is very closely related to *Xiphistes chirus*. It differs from it chiefly in having 3 anal spines, in the branches of the upper lateral line running higher, and in coloration. It is numbered 3132 on the register of the Leland Stanford Jr. University Museum.

117. **Xiphidion rupestre** (Jordan & Gilbert). Plate ciii.

Equally abundant with *Xiphidion mucosum* under rocks about Neah Bay. It does not reach such a large size as the latter.

118. **Xiphidion mucosum** Girard.

Abundant at Neah Bay, where it was found under rocks between tide marks, in company with *X. rupestre*. Reaches a length of 18 inches.

Family STICHÆIDÆ.

119. **Lumpenus anguillaris** (Pallas).

Taken in abundance with seines along sandy beaches in Puget Sound. It reaches a length of 20 inches.

Family CRYPTACANTHODIDÆ.

120. **Delolepis virgatus** Bean.

A stuffed skin from near Seattle is in the collection of the Young Naturalists' Society, collected by Prof. O. B. Johnson.

Family ANARRHICHADIDÆ.

121. **Anarrhichthys ocellatus** (Ayres). Wolf Fish.

Rare in Puget Sound; more common southward. It reaches a length of 8 feet, and is sometimes eaten. It feeds on crustacea and mussels, which it pulls off from the rocks and crushes between its powerful jaws.

Family ZOARCIDÆ.

122. **Lycodopsis paucidens** (Lockington).

Abundant in Puget Sound. Length about 10 inches. Not taken by us. The large-mouthed specimens, called by Jordan & Gilbert *paucidens*, are the male and the small-mouthed ones, called *pacificus*, the female of the same species.

Family SCYTALINIDÆ.

123. **Scytalina cerdale** Jordan & Gilbert. Plate civ.

Specimens were found in abundance in the loose gravel under boulders at Waadda Island, Neah Bay. It has not been taken since 1881, when Drs. Jordan & Gilbert took the two type specimens (one of which was afterwards destroyed by fire) in this locality.

The skeleton does not differ essentially from that of *Lycodopsis paucidens*, with which it has been compared. The skull is not at all depressed, the wide depressed form of the head of the fish is due to the fleshy cheeks. The frontals take up the greater part of the top of the skull, the parietals are separated by the supraoccipital, which extends forward to the frontals. Opercles all present. Lower jaw large and strong, Post-temporal scarcely so firmly attached as in *Lycodes;* the clavicle long and slender.

Family GADIDÆ.

124. **Microgadus proximus** (Girard). TOMCOD.

A few specimens obtained. Very abundant. Taken in large numbers by the fishermen. It is a food fish of some value, and meets with a ready sale. It reaches a length of a foot.

125. **Gadus macrocephalus** Tilesius. ALASKA COD.

Not uncommon in certain localities near Cape Flattery. This is probably its southern limit.

126. **Pollachius fucencis** (Jordan & Gilbert).

Occasionally taken in deep water in Puget Sound. Not obtained by us.

Family MERLUCCIIDÆ.

127. **Merluccius productus** Ayres. HAKE.

Abundant. It does not rank high as a food fish, as its flesh is soft and watery. It reaches a length of over 2 feet.

Family TRACHYPTERIDÆ.

128. **Trachypterus rex-salmonorum** Jordan & Gilbert. KING OF THE SALMON.

Very rare. Two specimens recorded from Neah Bay, where it is regarded by the Indians as a sacred fish, the King of the Salmon.

Family PLEURONECTIDÆ.

129. **Hippoglossus hippoglossus** (Linnæus). HALIBUT.

One of the most valuable fish taken in the region. It is found most abundant off Cape Flattery. Several fishing schooners are engaged in the halibut fishery. It reaches a weight of over 200 pounds, and a length of 5 or 6 feet.

130. **Eopsetta jordani** (Lockington).

Not abundant in Puget Sound. It reaches a length of 18 inches and a weight of 3 to 5 pounds. A fine food fish. Not seen by us.

131. **Hippoglossoides elassodon** Jordan & Gilbert.

Common. The types of this species were first obtained at Seattle and Tacoma, where it was taken with hook and line from the wharves. Length about a foot.

132. **Lyopsetta exilis** (Jordan & Gilbert).

A small flounder; not very abundant. It does not reach a length of over 9 inches. It is of no value as a food fish. A specimen in the collection of the Young Naturalists' Society has the right pectoral black, but it is not otherwise peculiar.

133. **Psettichthys melanostictus** Girard.

Abundant. It is one of the best of the flounders for food. It reaches a length of 20 inches.

134. **Citharichthys sordidus** (Girard).

Very common in deep water in the sound: weight 1½ pounds.

135. **Isopsetta isolepis** (Lockington).

Common in rather deep water. It reaches a length of 15 inches. Not taken by us.

136. **Isopsetta ischyra** (Jordan & Gilbert).

Not common. The type from Elliot Bay, near Seattle, where it was taken with a seine. Length 18 inches.

137. **Parophrys vetulus** Girard.

Very abundant. Many specimens collected with a seine in shallow water. It is a good market fish, and reaches a length of 14 inches. The young are spotted with blackish.

138. **Lepidopsetta bilineata** (Ayres).

Very common. Specimens secured in abundance on sandy beaches. About 18 inches in length. Puget Sound specimens are rougher than those found farther south.

139. **Platichthys stellatus** (Pallas). DIAMOND FLOUNDER.

The commonest flounder in the sound. It is not held in as high esteem as a food fish as some of the other flounders. It reaches a length of 2 feet. A few specimens preserved by us.

140. **Microstomus pacificus** (Lockington).

One specimen dredged from deep water in Puget Sound.

141. **Pleuronichthys cœnosus** Girard.

Rather common. The specimens taken show a black spot on sides and one on tail. It reaches a length of about a foot.

SUPPLEMENTARY.

LIST OF FRESH-WATER FISHES COLLECTED IN THE VICINITY OF SEATTLE, WASHINGTON, BY EDWIN C. STARKS.

BY ALVIN SEALE.

1. **Entosphenus tridentatus** (Gairdner). LAMPREY.

Three young specimens about 30 mm. in length were taken July 7 in a small stream which flows into Green Lake. Lamprey are reported as being very abundant in this lake during the spring. Great numbers, not only of *E. tridentatus*, but also of *Lampetra cibaria*, spawn in the small stream mentioned above.

2. **Catostomus macrocheilus** Girard.

A few small specimens collected in Green Lake, Seattle, 4 to 9 inches in length.

3. **Mylocheilus caurinus** (Richardson). "CHUB."

D. 8. A. 8. Head 4¾; depth 4½; scales 13–76–9; eye 4½ in length of head; snout 3½; teeth 1, 5–5, 1.

Fourteen specimens, 3 to 10 inches in length, were taken in Lake Washington, July 14. A very common species.

4. **Ptychocheilus oregonensis** (Richardson). "SQUAWFISH."

D. 9½. A. 8½. Head 3⅞ in body: eye 4½ in head: teeth 2, 4–5, 2: scales 12–74–9: caudal peduncle 3 in length of head: lateral line slightly decurved.

Thirty-three specimens, 2 to 9 inches in length, were taken in Lake Washington, July 14: 71 specimens of young were taken in Green Lake, July 24. This species was by far the most abundant fish in the lakes.

5. **Leuciscus balteatus** Richardson.

D. 10. A. 18. Head 4½: depth 3⅔: eye 2½ in head: teeth 2, 5–4, 2: scales 13–60–3: caudal peduncle 2⅔ in length of head.

About 50 specimens, 2 to 4½ inches in length, were taken in Green Lake, July 29. Three of the larger of these had a bright rosy band extending along the sides from the head back as far as the vent. These three specimens were opened, and proved to be females filled with eggs. No males showed the rosy color. About 60 small specimens were taken in Lake Washington, July 27. They showed no perceptible variation from those in Green Lake. A very abundant species.

6. **Salmo mykiss** Walbaum. "CUT-THROAT TROUT."

Two specimens, 9 inches in length, were taken with hook and line in Lake Washington, July 14. Very common.

7. **Oncorhynchus nerka** (Walbaum). SALMON.

Six large specimens taken November 7, 1892, and two taken June 30, 1895, in Lake Washington. Those taken June 30 were more silvery in color than the ones taken November 7, the latter being quite dark. A very abundant species.

8. **Gasterosteus microcephalus** Girard.

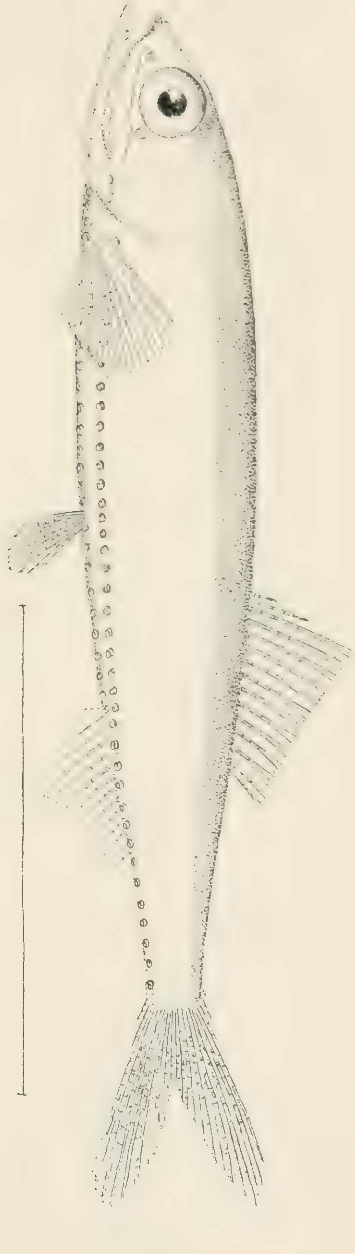
One adult 58 mm. in length, and three young 34 mm. in length, were taken in Green Lake. The adult had 7 well developed plates, the young had but 5. It was of interest to note that these specimens seemed to indicate that the young have the plates well developed first on the sides· below and between the dorsal spines, and that the dorsal portions of the plates were the first to develop. The young were much lighter in color than the adult. Eleven specimens, apparently all adults, were taken in Lake Union. These were apparently similar to those from Green Lake, except they had 9 or 10 plates.

9. **Cottus asper** Richardson.

Twenty-eight specimens, 2 to 5 inches in length, taken July 26, in Lake Washington. A common species.

LIST OF PLATES.

LXXVI. Zalarges nimbarius: type. Open sea.
LXXVII. Hexagrammus otakii: type. Tokio.
LXXVIII. Oxylebius pictus. From Monterey.
LXXIX. Jordania zonope: type. Point Orchard.
LXXX. Ruscarius meanyi: type. Point Orchard.
LXXXI. Radulinus asprellus. Near Seattle.
LXXXII. Oligocottus embryum: type. Neah Bay.
LXXXIII. Dasycottus setiger. From Unalaska.
LXXXIV. Ascelichthys rhodorus. From Waadda Island.
LXXXV. Psychrolutes zebra. From Point Orchard.
LXXXVI. Gilbertina sigalutes: type. Point Orchard.
LXXXVII. Rhamphocottus richardsonii. From Point Orchard.
LXXXVIII. Podothecus accipiter: type. Robin Island.
LXXXIX. Podothecus veternus: type. Robin Island.
XC. Stelgis vulsus: type. Point Reyes.
XCI. Averruncus emmelane: type. Point Orchard.
XCII. Xystes axinophrys: type. Point Orchard.
XCIII. Xenochirus triacanthus. From Point Orchard.
XCIV. Lethotremus vinolentus: type. Point Orchard.
XCV. Neoliparis mucosus. From off San Francisco.
XCVI. Neoliparis greeni: type. Victoria.
Neoliparis floræ: type. Waadda Island.
XCVII. Liparis cyclopus. From Elliot Bay, near Seattle.
XCVIII. Liparis dennyi: type. Admiralty Inlet, near Seattle.
XCIX. Ronquilus jordani. From Elliot Bay.
C. Clevelandia ios. From Elliot Bay.
CI. Bryostemma nugator: type. Elliot Bay.
CII. Xiphistes ulvæ: type. Waadda Island.
CIII. Xiphidion rupestre. From Waadda Island.
CIV. Scytalina cerdale. From Waadda Island.



ZALARGES NIMBARIUS

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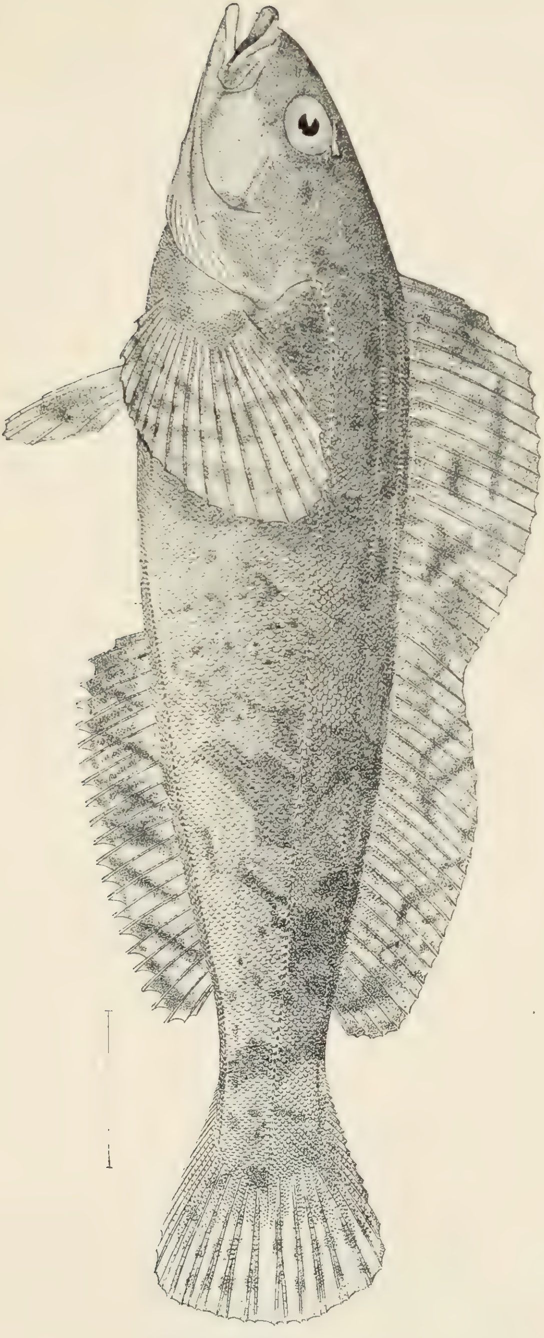

HEXAGRAMMUS OTAKII

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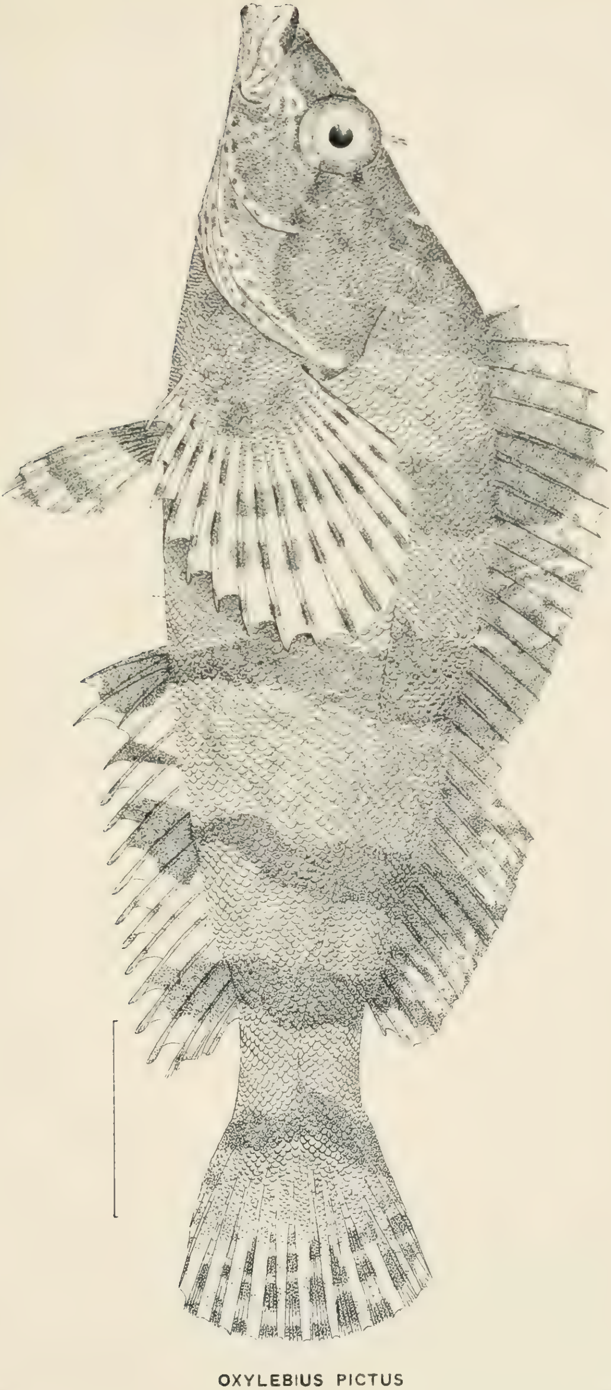

OXYLEBIUS PICTUS

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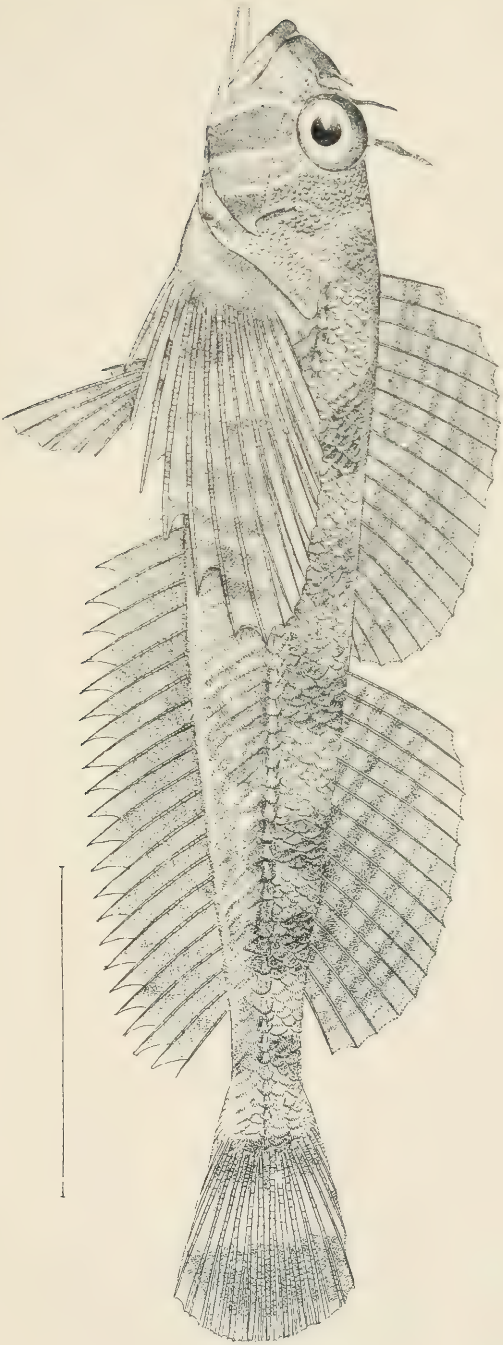

JORDANIA ZONOPE

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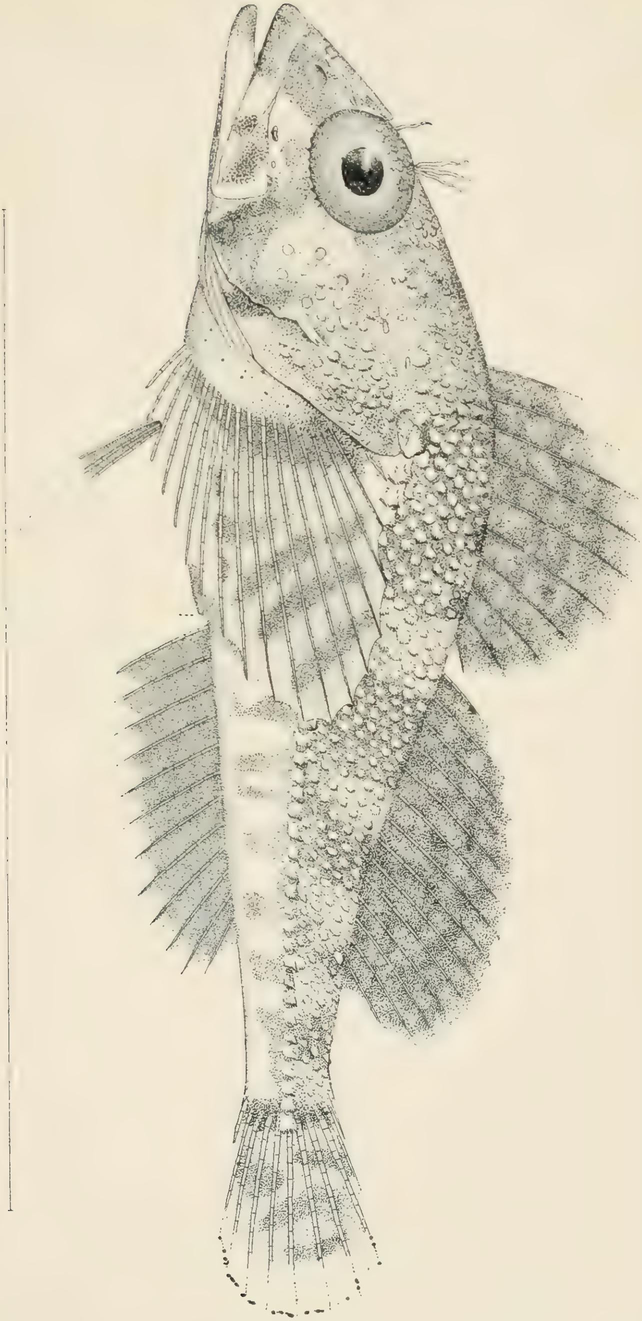

RUSCARIUS MEANYI

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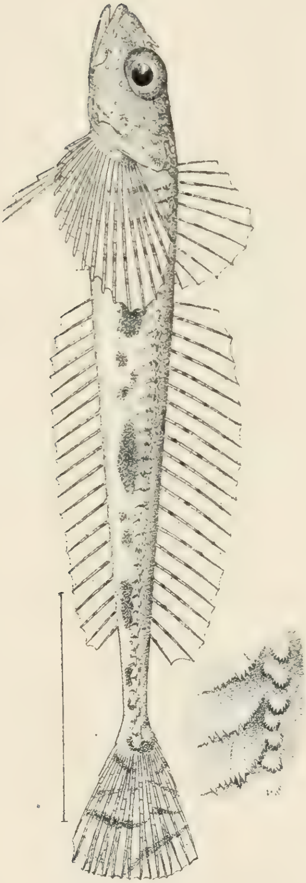

RADULINUS ASPRELLUS

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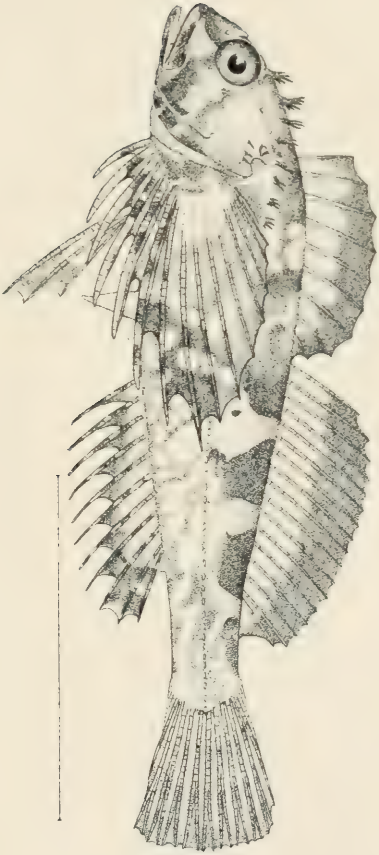

OLIGOCOTTUS EMBRYUM

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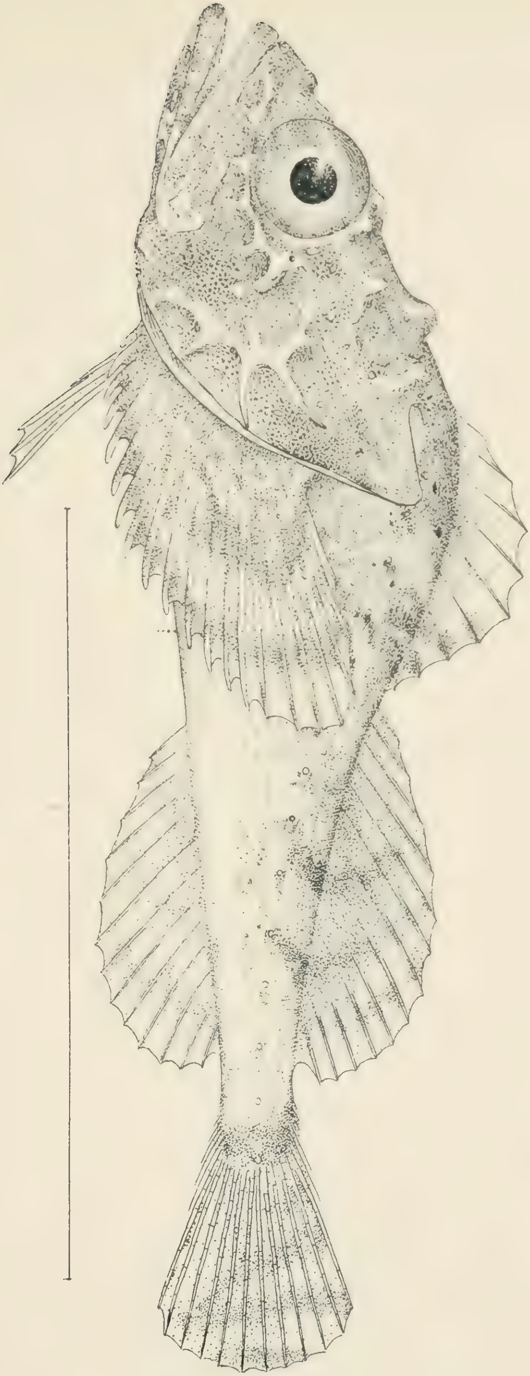

DASYCOTTUS SETIGER

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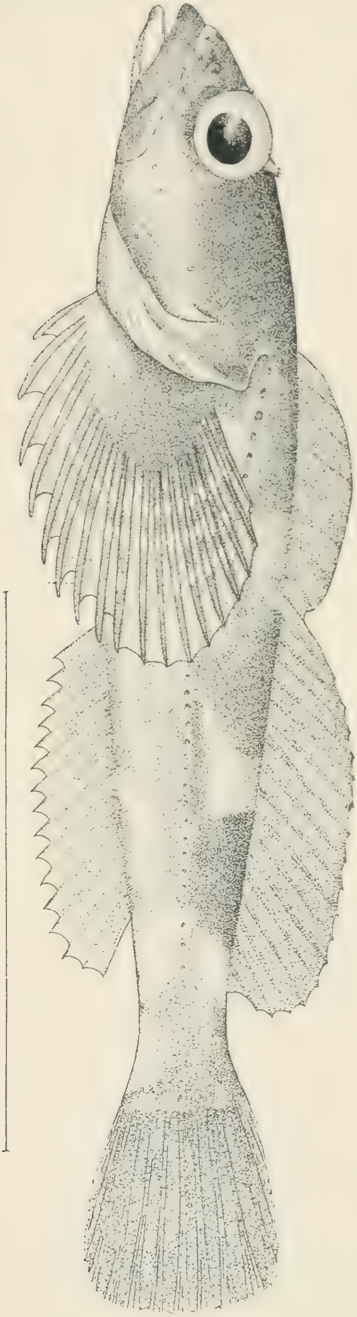

ASCELICHTHYS RHODORUS

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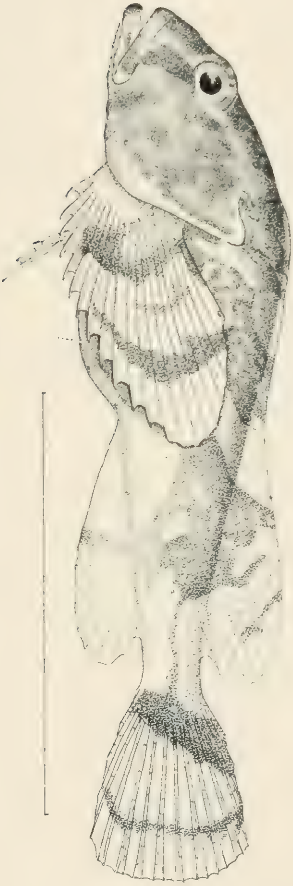

PSYCHROLUTES ZEBRA

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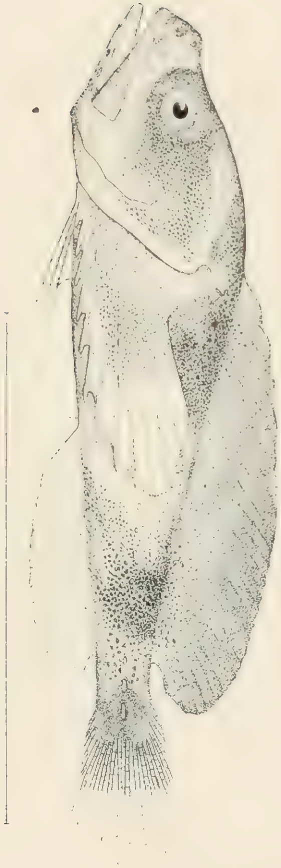

GILBERTINA SIGALUTES

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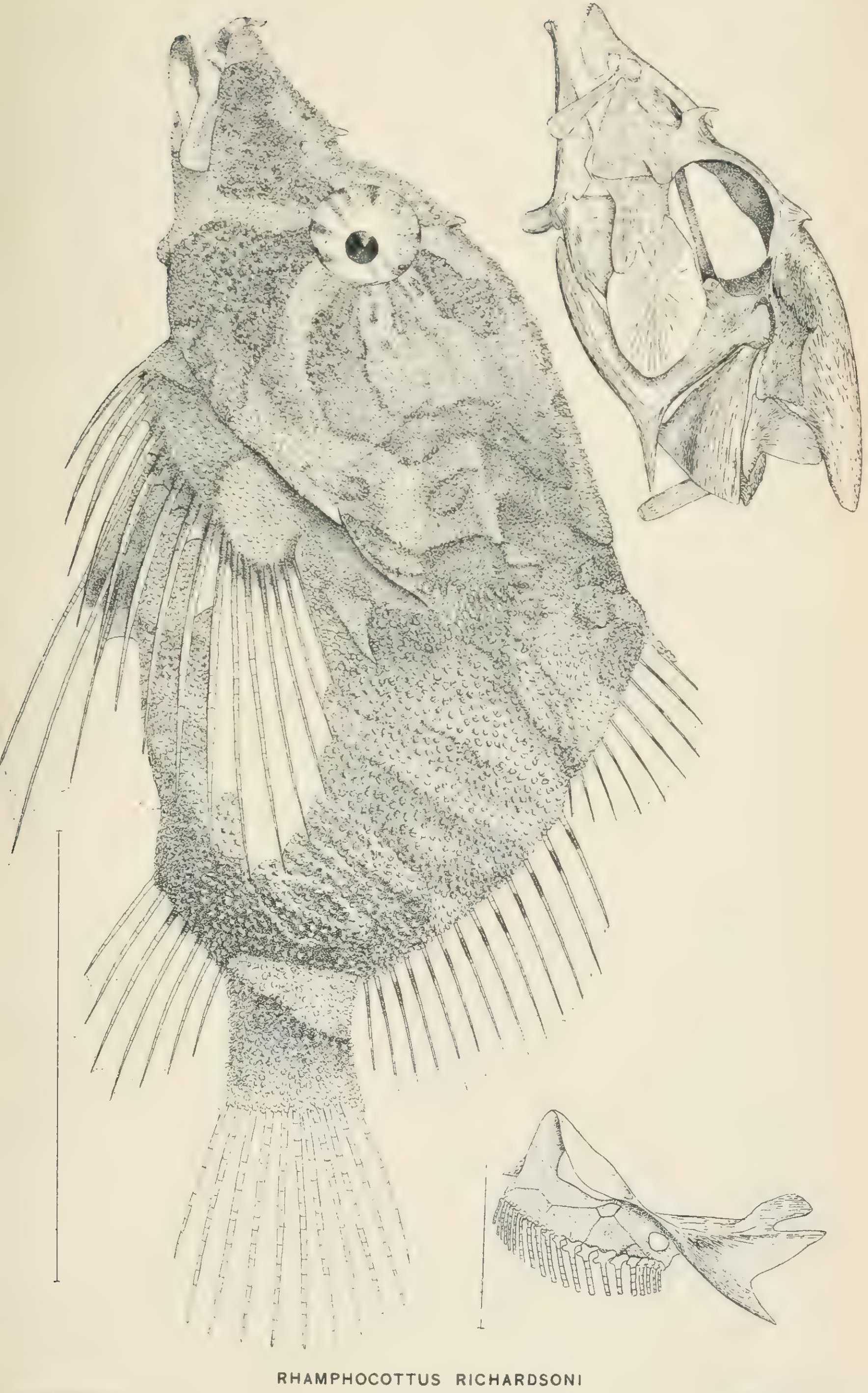

RHAMPHOCOTTUS RICHARDSONI

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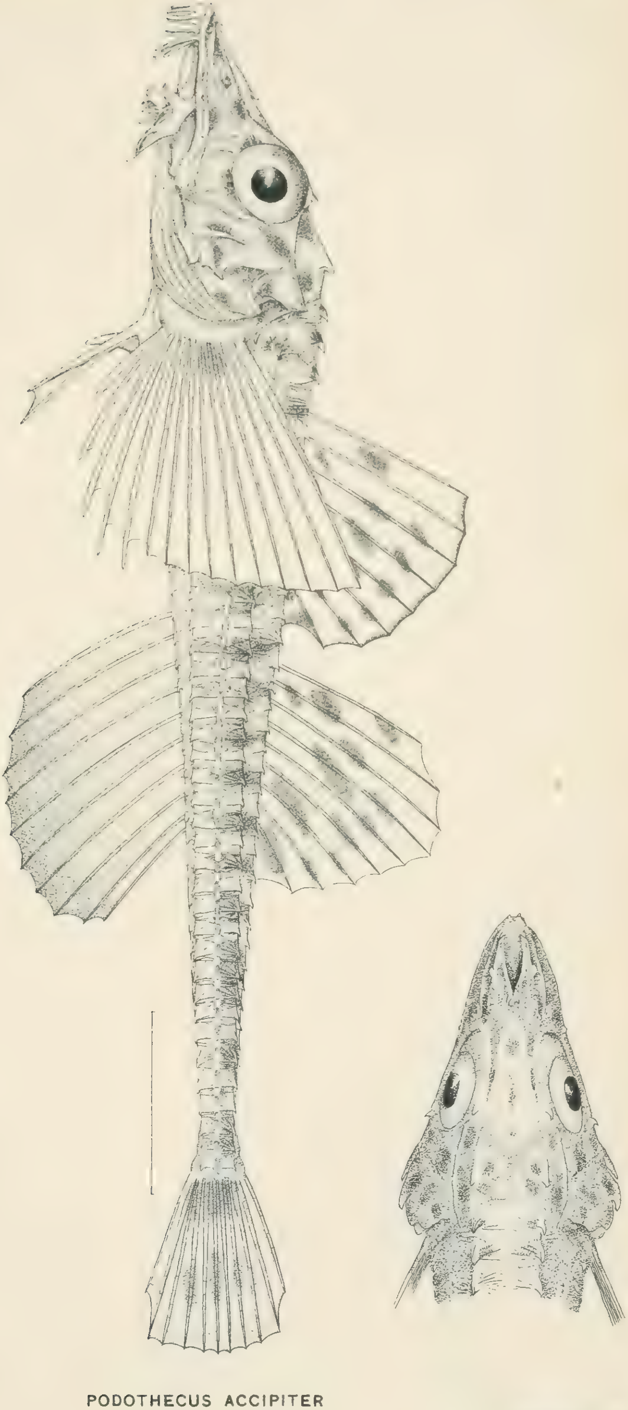

PODOTHECUS ACCIPITER

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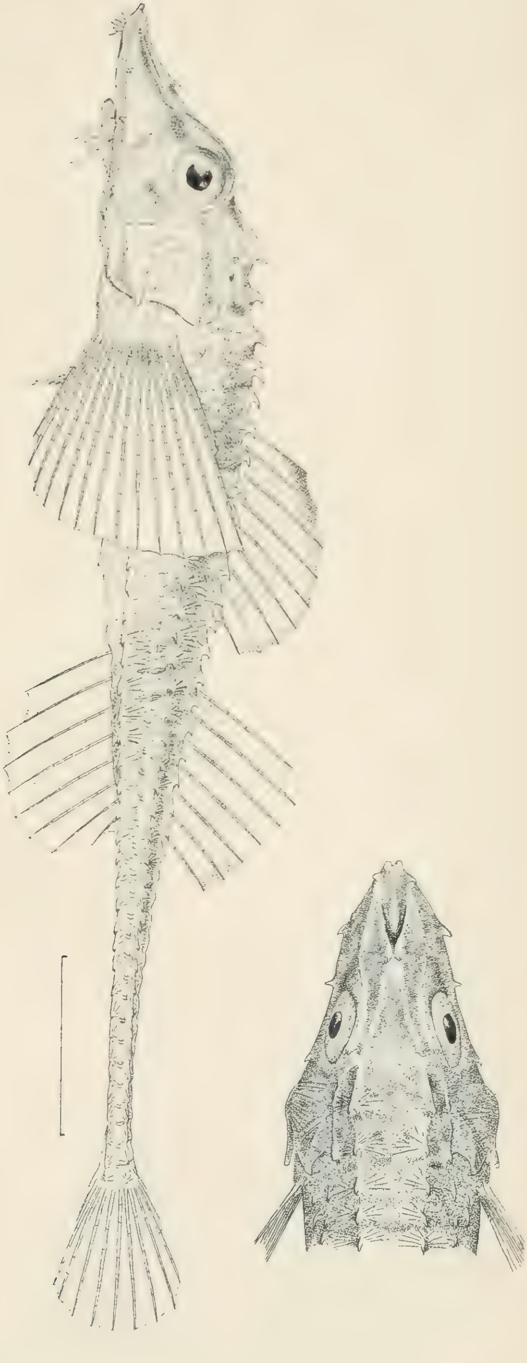

PODOTHECUS VETERNUS

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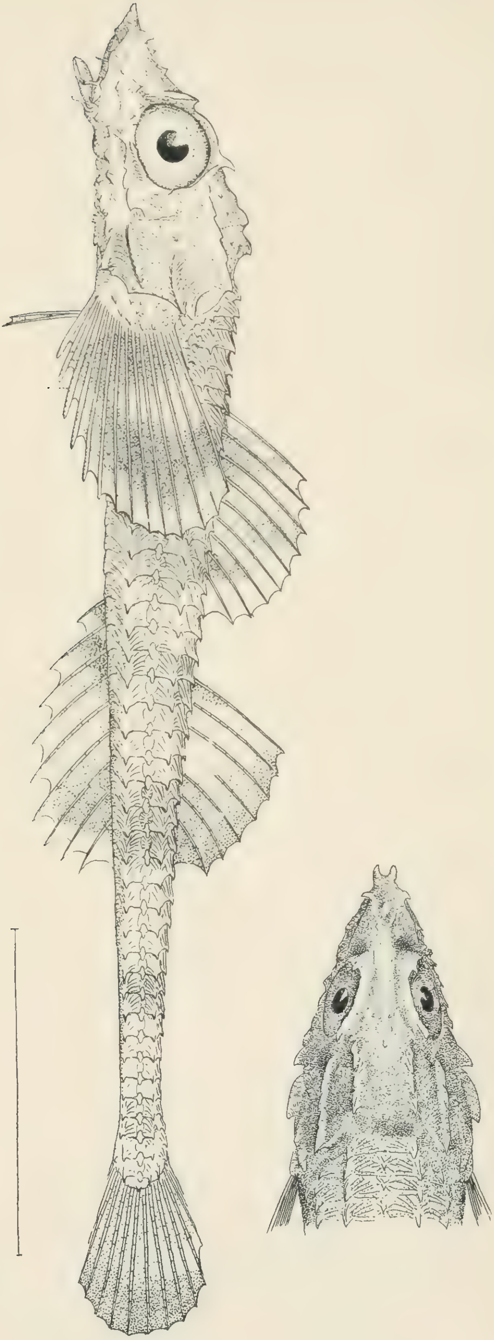

STELGIS VULSUS

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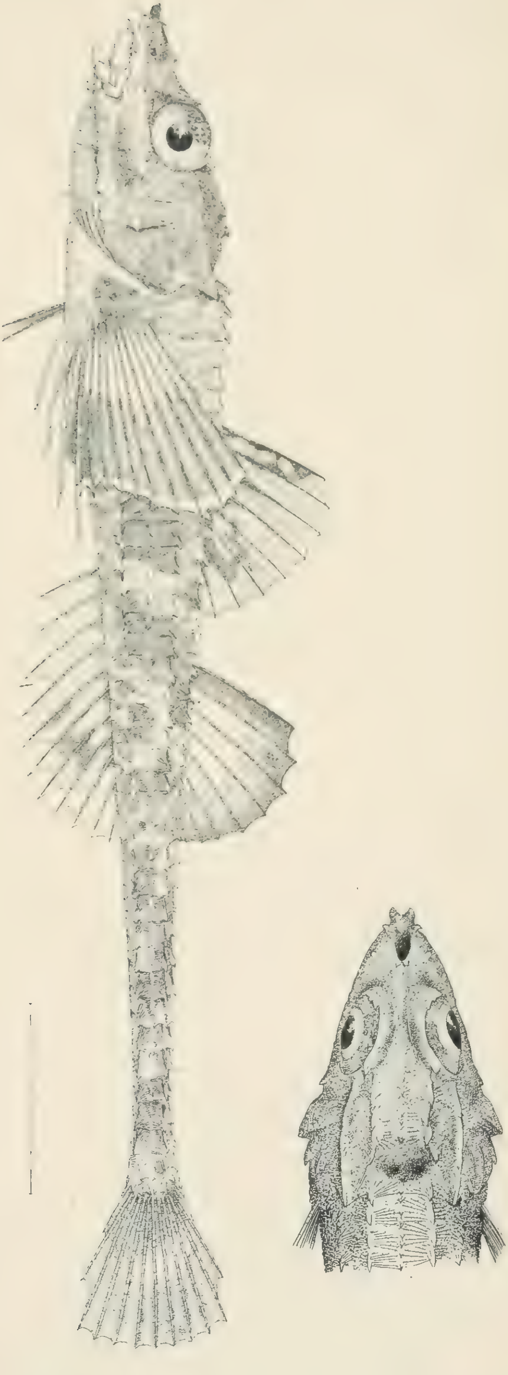

AVERRUNCUS EMMELANE

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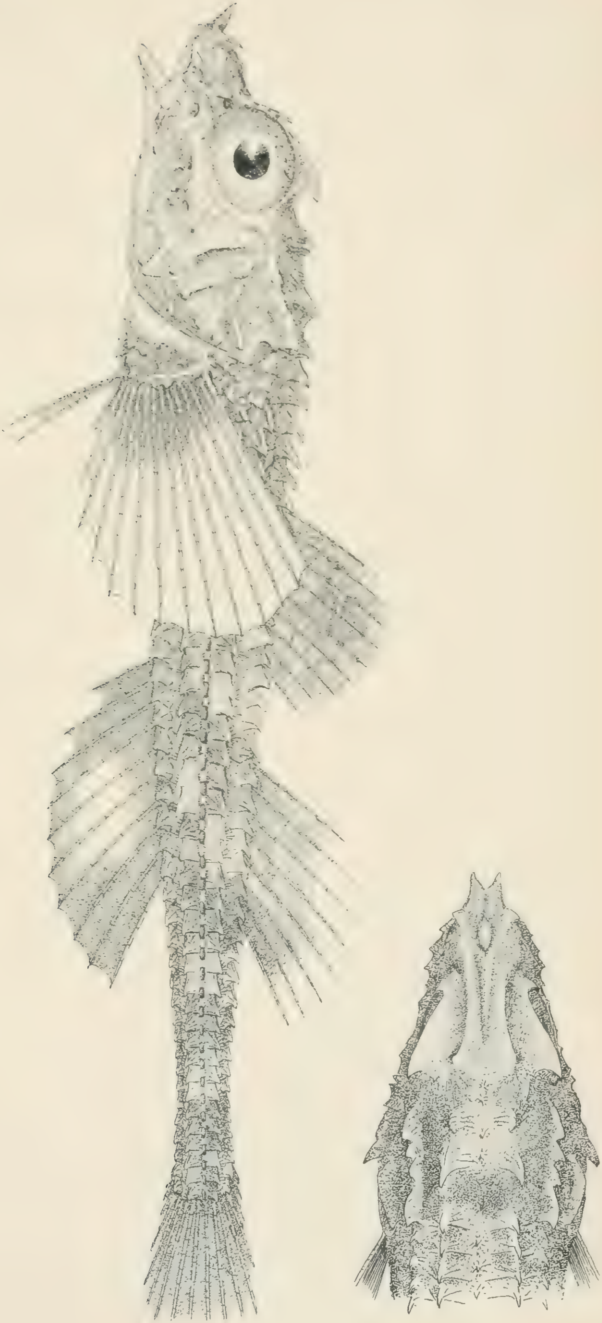

XYSTES AXINOPHRYS

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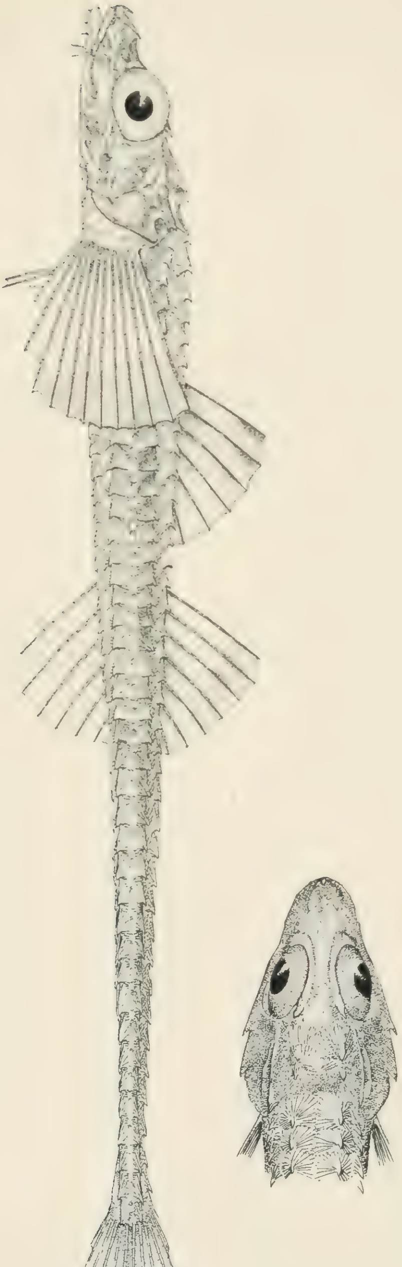

XENOCHIRUS TRIACANTHUS

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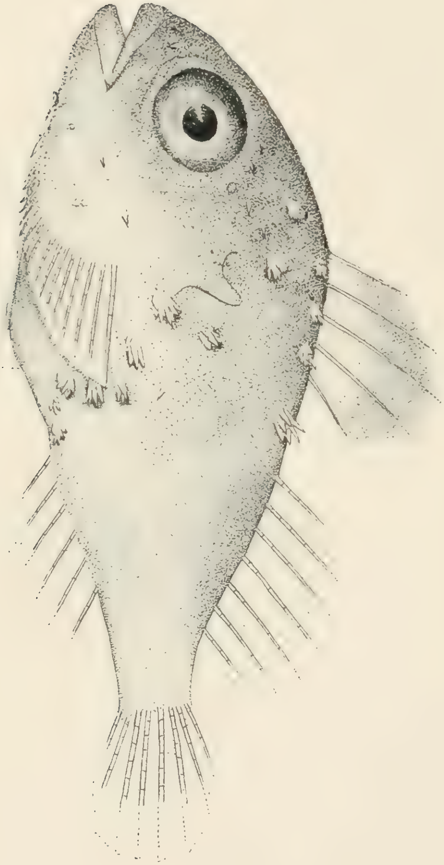

LETHOTREMUS VINOLENTUS

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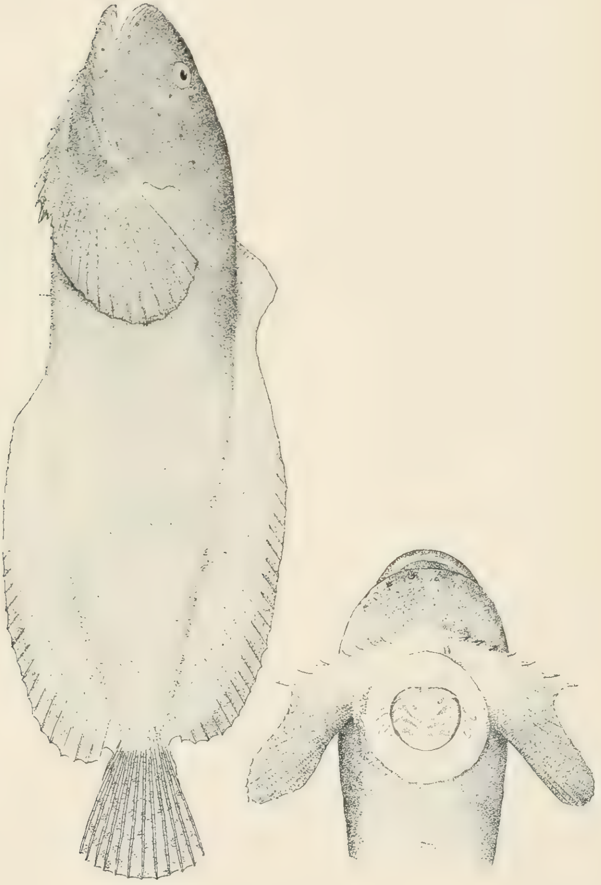

NEOLIPARIS MUCOSUS

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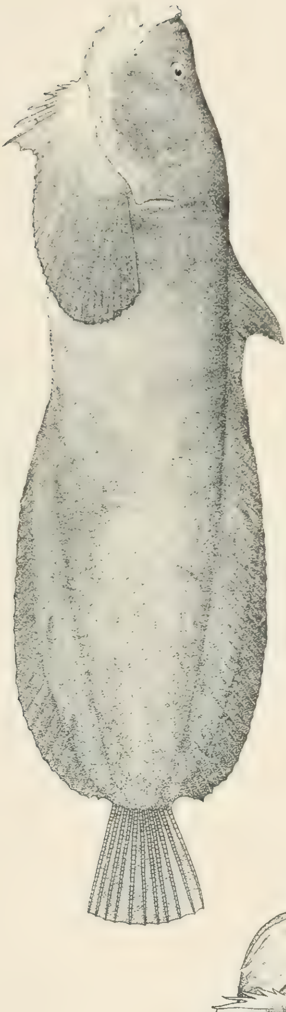
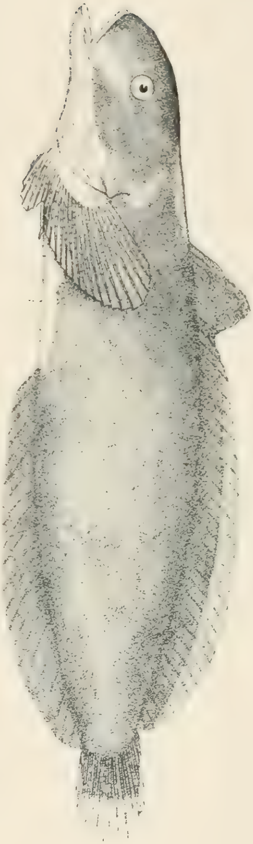
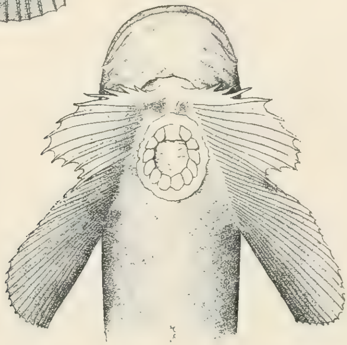


NEOLIPARIS GREENI



NEOLIPARIS FLORÆ



NEOLIPARIS GREENI

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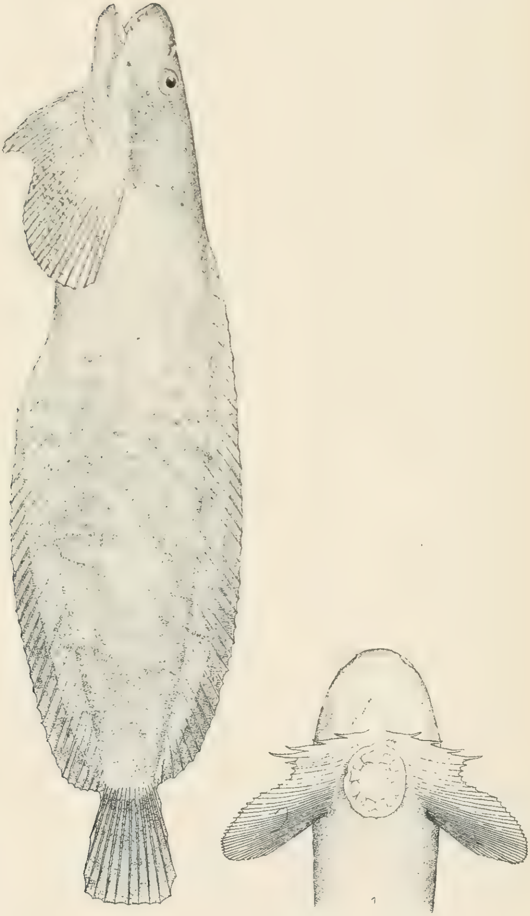

LIPARIS CYCLOPUS

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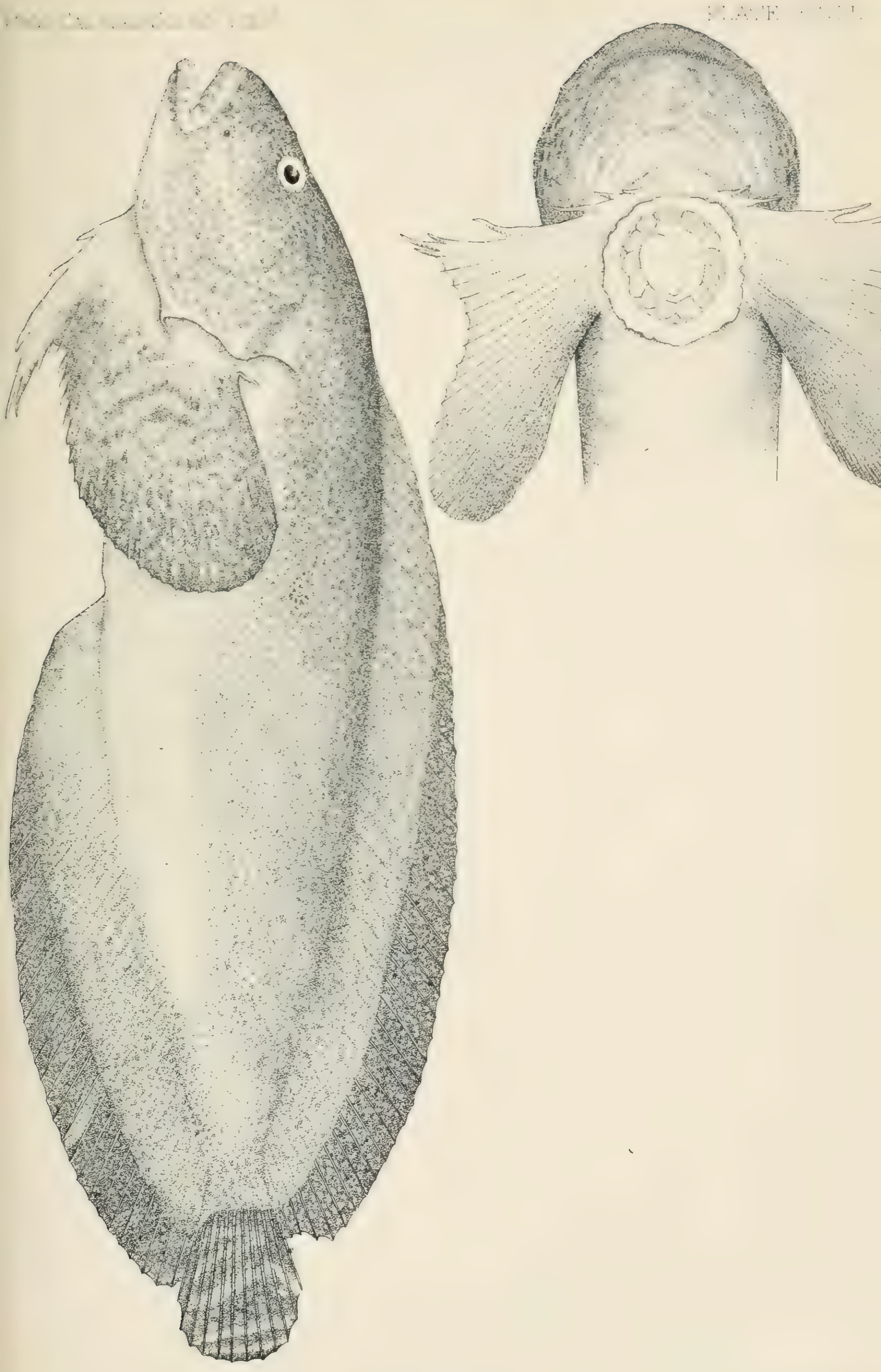

LIPARIS DENNYI

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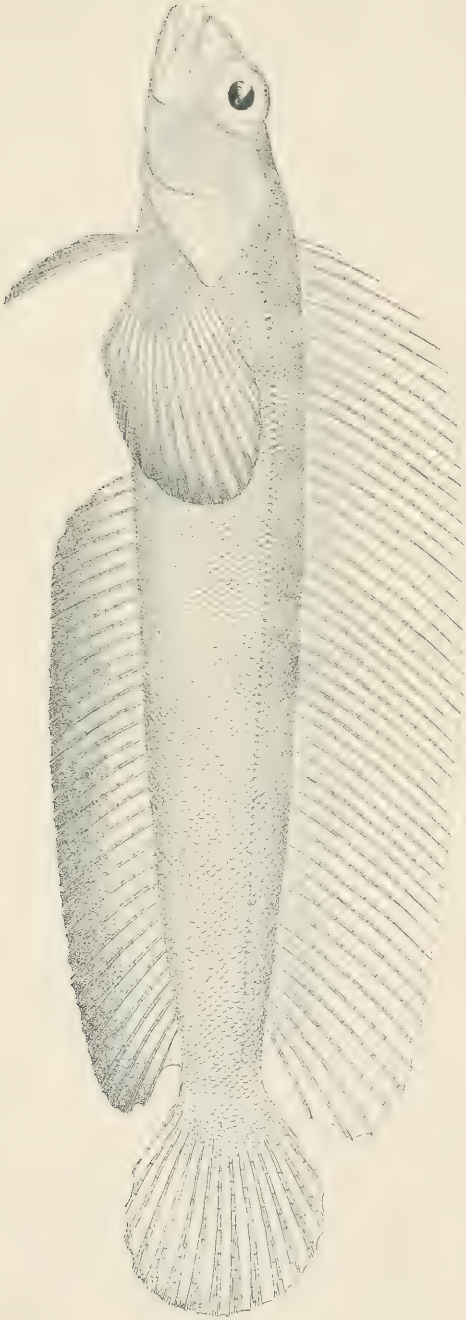
PLATE



RONQUILUS JORDANI

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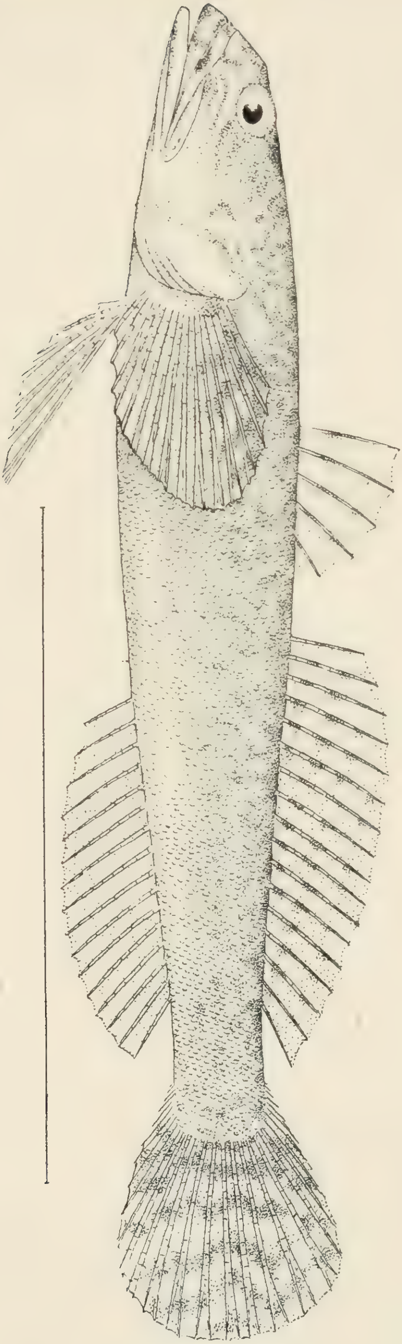

CLEVELANDIA IOS

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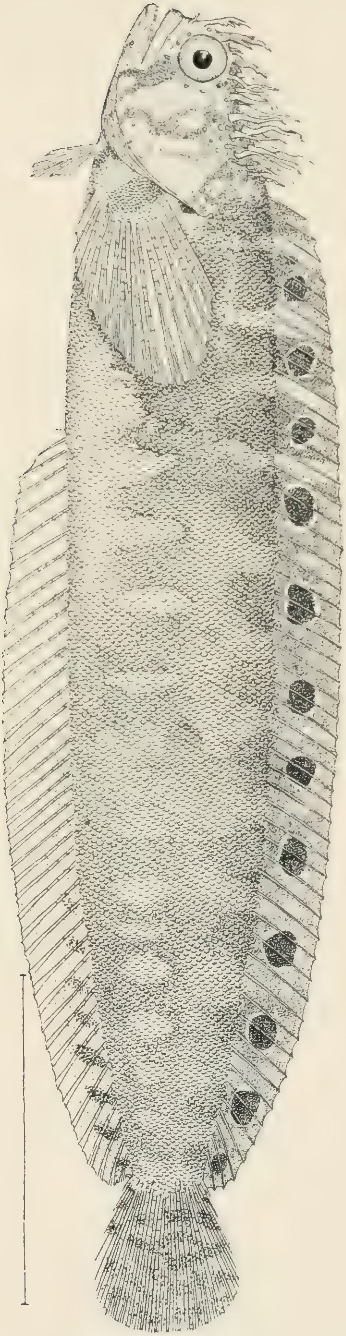

BRYOSTEMMA NUGATOR

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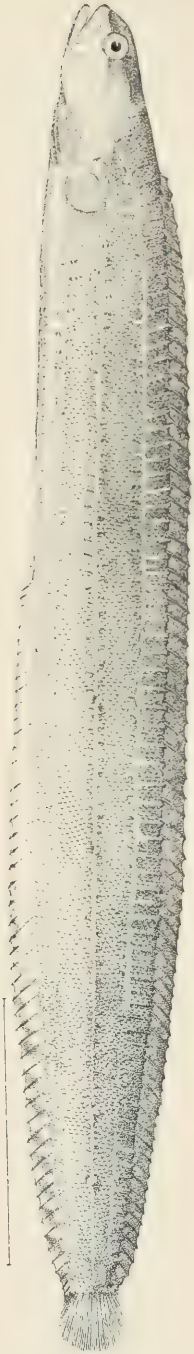

XIPHISTES ULVAE

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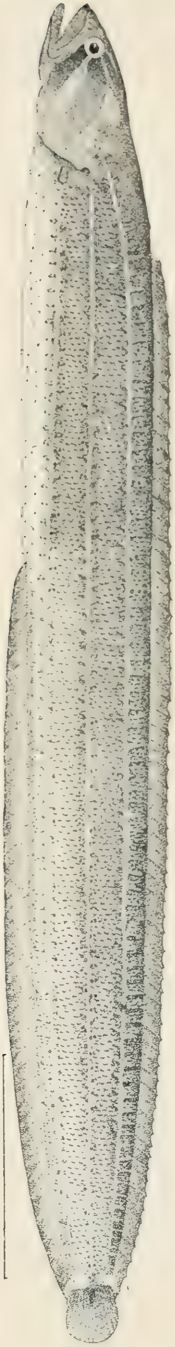

XIPHIDION RUPESTRE

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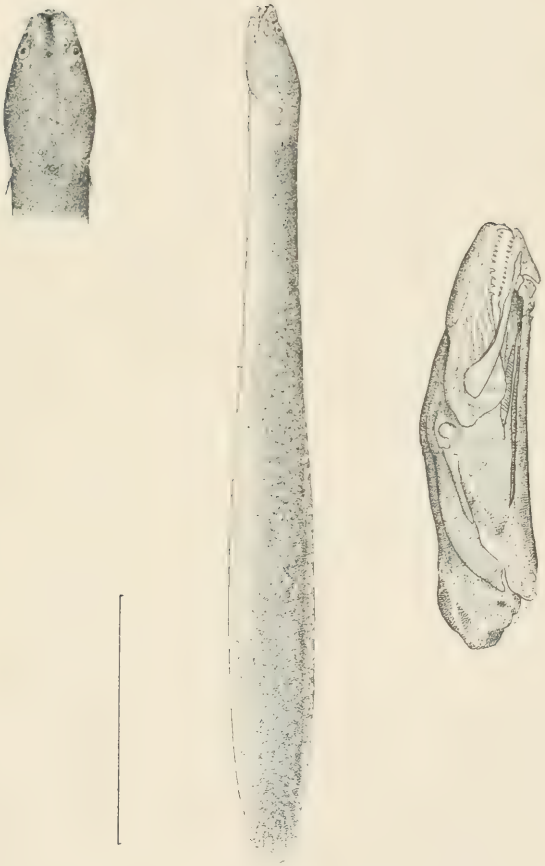

SCYTALINA CERDALE

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IV

NEW MALLOPHAGA,

I,

WITH SPECIAL REFERENCE TO A COLLECTION MADE
FROM MARITIME BIRDS OF THE BAY OF
MONTEREY, CALIFORNIA.

BY

VERNON L. KELLOGG,

Associate Professor of Entomology, Leland Stanford Jr. University.

Leland Stanford Jr. University,
Palo Alto, California,
1896.

NEW MALLOPHAGA, I,—WITH SPECIAL REFERENCE TO A COLLECTION MADE FROM MARITIME BIRDS OF THE BAY OF MONTEREY, CALIFORNIA.

(With Plates ii–xv.)

BY VERNON L. KELLOGG.

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  Explanation of Plates.

THE MALLOPHAGA—INTRODUCTION.

The Mallophaga constitute a small order of parasitic insects which live externally on the bodies of birds and mammals. The insects are small, one-tenth of an inch being perhaps an average length, wingless, and have biting mouthparts, with which they feed on the feathers or hair of their host, not sucking blood as the true lice do. They have an incomplete metamorphosis. The structure and habits of the insects have until recent years been very imperfectly understood—even yet the position of the group among insects is but provisionally established (see *postea),* and the knowledge of the life history is strangely incomplete.

In America, besides some account of the commoner forms infesting domestic birds and mammals included in Professor Herbert Osborn's "The Pediculi and Mallophaga affecting Man and the Lower Animals" (Bull. No. 7, 1891, Div. of Ent., U. S. Dept. Agric.), and a discussion by Prof. A. S. Packard (Proc. Amer. Phil. Soc., 1887, vol. xxiv) of the position of the group among insects, practically nothing touching the systematic consideration of the group has been published.

Historical and Bibliographical.

European.—The Mallophaga are first recognizably mentioned in the writings of Redi (1668 and 1686), where the common *Trinoton luridum* of the ducks may be recognized in his "louse of the teal," and the common *Lipeurus baculus* of the pigeons is evidently the subject of his description of "*Pulex columbæ majoris.*" In the various writings of Albin (1720), Otto Fabricius (1780), J. C. Fabricius (1781, 1787, 1805), De Geer (1778), Linné (1746, 1789), Scopoli (1763), Schrank (1776, 1781, 1804), Panzer (1793), and others, curious accounts and brief descriptions of the common Mallophaga are to be found.

It is to the writings of Christian Ludwig Nitzsch, Professor of Zoology in the University of Halle, in the succeeding century, however, that we turn for a definite memoir which may be recognized as a real beginning of the systematic study of the Mallophaga. Nitzsch's "Die Familien und Gattungen der Thierinsekten (Insecta Epizoica) als ein Prodromus Naturgeshichte derselben," published in Germar's Magazin der Entomologie, vol. iii, 1818, Halle, presents the essential features of the classification of the group now used, and contains the earliest accepted nomenclature. Since the publication of this pioneer memoir four monographic works have been issued, together, needless to say, with numerous lesser memoirs containing descriptions of new species, compiled and more or less comprehensive conspecti of the group in text-books, and morphological treatises.

The monographs indispensable to the student of the Mallophaga are Henry Denny's Monographia Anoplurorum Britanniæ, or an Essay on the British Species of Parasitic Insects, 1842, London, illustrated with colored plates; Christoph Giebel's "Insecta Epizoa, die auf Säugethieren und Vögeln schmarotzenden Insekten, nach Chr. L. Nitzsch's Nachlass bearbeitet, mit XX Tafeln nach Nitzsch's Handzeichnungen," 1874, Leipzig; E. Piaget's "Les Pediculines, Essai Monographique, vol. i, Texte, vol. ii, Planches, 1880, Supplement, 1885," Leyden; and O. Taschenberg's "Die Mallophagen, mit besonderer Berücksichtigung der von Dr. Meyer gesammelten Arten," Nova Acta der Ksl. Leop.-Carol. Deutschen Akademie der Naturforscher, Band xliv, No. 1, 1882, Halle. Of these monographs Denny's is limited to a consideration of the parasites found on birds collected in England, his descriptions are too brief, and the colored figures too superficially drawn, so that it is often impossible to recognize from his description and illustration the species of parasite which he had under consideration. Giebel's monograph, as indicated in the title, is based on the unpublished descriptions and drawings of Nitzsch. Giebel also had access to the specimens collected and prepared by Nitzsch. The work is a monumental one, although many of the descriptions are incomplete, and the colored illustrations leave much to be desired in the way of accurate detail. Piaget's monographic essay is easily the most valuable treatise on the group, the descriptions being good, the uncolored figures in every way admirable, and the scope of the work truly monographic. Piaget has fairly attempted to include in his original essay a consideration of every species of Mallophaga described up to 1880. In his Supplement he publishes the descriptions of more than 100 new species which have come under his observation. Taschenberg's memoir is the first part of what he hopes to make a complete monograph of the group. It includes the genera *Goniodes*, *Goniocotes*, *Lipeurus*, *Ornithobius*, *Akidoproctus* and *Trichodectes*. The descriptions of new species are very complete, and the keys to species in the considered genera of great value; the illustrations only, though good, are not up to the exceptionally high standard of the work. Taschenberg, like Giebel, has had access to Nitzsch's types.

Of the lesser systematic memoirs Nitzsch's posthumous papers, edited by Giebel, in the Zeitschrift für gesammte Naturwissenschaft, vols. xvii, 1861, xviii, 1861, and xxviii, 1866, are the most important; all of their contents are, however, included in the Insecta Epizoa. Next in importance, as far as number of described species goes, are Rudow's papers, consisting of an inaugural dissertation (1869) and several articles in the Zeitschrift für gesammte Naturwissenschaft, 1869–1870. Rudow's descriptions are deplorably incomplete; Piaget has practically discarded them in his monograph. Of treatises on the Mallophaga to be found in text-books of general entomology, that in Burmeister's Handbuch der Entomologie, 1832, is markedly the most complete.

Finally, of morphological memoirs, those of Kramer on

Lipeurus jejunus (Zeitschr. f. wiss. Zool., 1869, vol. xix, p. 452), of Melnikoff on the embryology of the Mallophaga and of the Pediculidæ (Archiv f. Naturgesch., 1869, vol. xxxv, p. 136), and of Grosse on the anatomy of *Tetraopthalmus chilensis* [=*Menopon titan*] with some comparative studies (Zeitschr. f. wiss. Zool., 1885, vol. xlii, p. 530), are the most important. A full abstract of Grosse's paper was published by Macloskie in the American Naturalist, 1886, vol. xx, p. 340, and is thus readily accessible to American students.

A few descriptions of new species have been published recently by Piaget (Tijdschr. v. Ent., and Notes of the Leyden Museum), and by Picaglia (Atti d. Soc. Ital. di Sci. Nat., and Atti d. Soc. dei Nat. di Modena).

I append a bibliographic list of the more important systematic and morphological memoirs. Full bibliographic lists are to be found in the monographs of Giebel and Piaget. A good list is that published by Picaglia at the beginning of his paper, "Pediculini dell'Istituto anatomo-zoologico della R. Università di Modena," Atti d. Soc. dei Naturalisti di Modena, 1885, serie 3, vol. iv.

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AMERICAN. As already mentioned in the Introduction, there are practically no American systematic papers on the Mallophaga excepting Professor Herbert Osborn's account of "The Pediculi and Mallophaga affecting man and the lower animals" (Bulletin 7, 1891, Division of Entomology, U. S. Dept. Ag.) Of this bulletin pages 30–54 treat of Mallophaga found on domestic mammals and birds, including the cat, dog, bear (sic), llama, goat, sheep, horse, mule, cow, guinea-pig, pouched gopher (sic), duck, goose, swan, chicken, pigeon, peacock, pheasant, guinea-fowl and turkey. Many of the species referred to in the bulletin have evidently been observed on animals in America by Professor Osborn, but just how many and what species are not told. One new species, *Trichodectes geomydis*, found abundantly on the Pocket Gopher, is described and figured. I find this species common on *Thomomys talpoides bulbivorous* in this State (California). Among the illustrations of the bulletin are twelve original ones, indicating that at least these twelve species have been personally observed by Professor Osborn.

In the American Monthly Microscopical Journal for November, 1894, Professor Osborn publishes a key to the genera, including in it all of the genera then known, excepting Westwood's *Ancistrona* and Taschenberg's *Eurymetopus* and *Bothoriometopus*.

In the American Naturalist, 1871, in a paper entitled "Certain Parasitic Insects," Professor A. S. Packard names, illustrates, and briefly describes seven new species of Mallophaga collected from American birds. Unfortunately neither the descriptions nor illustrations have been sufficient to enable any one of these species to be recognized by subsequent writers. Similarly Dr. Leidy in the Proceedings of the Academy of Natural Sciences of Philadelphia, refers in briefest terms to a *Menopon* taken from *Pelecanus erythrorhynchus* (Florida) and names it *Menopon perale* (see *Menopon titan*, this paper).

Of other American literature on the Mallophaga, there are in the Proceedings of the Boston Society of Natural History, 1851, brief abstracts of two papers read before the Society by Dr. W. I. Burnett on "the external parasites of warm-blooded animals" and "observations on the relations of an order of parasites (lice) to the different faunæ, as bearing, first on the distinct creation of types of animals, and second on the local creation of these types wherever they are found." Dr. Burnett noted that "although there are single species (of parasites) peculiar to particular animals, there are others which are found on different species of the same genus as is the case in the parasites living on birds of the genus *Larus* (Gulls) and the diurnal birds of prey." From an examination of the structure of these animals, Dr. Burnett was of opinion that they should be placed in an order by themselves, closely allied to the Insecta; "they number about 250 species, the mandibulate parasites occupying the highest and the haustellate the lowest position in the order." In the second paper Dr. Burnett makes a curious argument for the theory of a special creation of each species of animal based on the facts shown in his study of the distribution of their parasites.

Prof. A. S. Packard read at the meeting of the American Philosophical Society, September 2, 1877, a paper "On the Systematic Position of the Mallophaga," which was published in the Proceedings of the Society, 1887, vol. xxiv, p. 264. Prof. Herbert Osborn has published in Insect Life, 1890, vol. iii, p. 115, a "Note on the Period of Development in Mallophaga," and in the same journal, 1891, vol. iv, p. 187, a paper on the "Origin and Development of the Parasitic Habit in Mallophaga and Pediculidæ."

I append a list of the American papers.

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STRUCTURE.

EXTERNAL.—The characteristic external appearance of the Mallophaga is due to a structural condition incident to the parasitic habits of the insects. The body is small, wingless, greatly flattened and usually strongly chitinized. There are no indications of wings in any stage of the insect's life.

Head (fig. 7, plate ii). The head is large in proportion to the whole size of the body, flat (slightly convex above and slightly concave below), and variously crescentic, reniform, quadrangular, triangular, narrowly or broadly conical. It is usually sparsely haired, the hairs appearing specially along the acute lateral margins. The mouth parts and oral opening are on the under side of the head; and the antennæ are outstretched or concealed in excavations on the under side. The most conspicuous character of the fixed parts of the head, other than their extremely flattened condition, is the great development of the clypeus which usually forms the principal part of the head in front of the antennary insertions, and is prolonged as a flat, tapering or expanding, colored or partly uncolored plate, whose anterior margin, variously notched, roundly emarginated, truncated or convex, forms the frontal line of the head. The suture separating the clypeus from the epicranium is usually distinct or unmistakably indicated, sometimes indistinguishable. The hind-head is usually widest across the temporal region, the temples often being strongly expanded laterally with angulated or rounded margin. The occipital region is usually concave, so that the head sits "hat-like" on the prothorax. The head presents certain chitinous bands projecting forward from the occipital margin, inwardly from the eyes, forward from the bases of the antennæ, etc. The presence or absence and the character of these bands are used as distinguishing specific characters, and the bands are named and defined in the Terminology (see *postea*).

The antennæ (figs. 10, 11 and 12, plate ii) are short, 3-, or 4-, or 5-segmented and vary much in shape and character. They are filiform (suborder Ischnocera) or clavate or capitate (suborder Amblycera), and sometimes differ in the two sexes of the same species. When this is the case they are the antennæ of the male which depart from the typical condition, showing appendages on one or more segments, probably used for grasping the female. The antennæ arise from or near the lateral margins of the head, and usually from about the middle of the margin. The fossa may be deep or shallow; its angles projecting and acute or short and rounding; and the antennæ may project directly and always from the head (suborder Ischnocera) or they may lie concealed in excavations on the under side of the head (suborder Amblycera).

The eyes are simple and are located in the lateral margins of the hind-head not far behind the antennary fossæ, in a deep or shallow ocular emargination of the lateral margin, or on the non-emarginated margin. They are two in number, although each is sometimes slightly or almost completely divided by an angular emargination. They are flatly convex to hemispherical, and clear to strongly colored.

The mouth parts (figs. 7, 8, 9, plate ii), situated on the under side of the head, and variously from the middle of this aspect to the frontal margin, are fitted for biting and consist of rather large, strongly chitinized, usually two-toothed, usually sharply pointed mandibles, inconspicuous and as yet imperfectly known maxillæ without *palpi, and a labium of various character and size; either large and with 4-segmented palpi (family Liotheidæ) or small and without palpi (family Philopteridæ). Despite the good work of Grosse the knowledge of the mouth parts of the Mallophaga is still manifestly incomplete.

Thorax. The thorax, which is composed usually of but two segments (three in but three genera), the meso- and metathorax being indistinguishably coalesced, is flat, larger than broad, and variously shorter than the head to much longer than the head (in one species as long as the abdomen). The lateral borders of both sclerites are strongly chitinized. The metathorax sometimes closely resembles an abdominal segment and is often closely joined to the first abdominal segment. The prothorax usually bears one to a few stiff hairs on its lateral margins; the metathorax often bears in addition to the hairs almost always present in the lateral angles, a series of long, strong hairs ranged along the posterior margin. These hairs may arise from small uncolored (unchitinized) spaces and

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*The earlier writers, Nitzsch *et al.*, ascribe the visible palpi to the maxillæ; Grosse is positive of their labial connection. A study of the anatomy of the Mallophaga, now being made in my laboratory, will, it is hoped, afford some further data on the mouth parts subject.

project upwards, being undoubtedly tactile organs. In the case of the three genera in which the mesothorax can be distinguished from the metathorax, this separation is especially evident in immature specimens, as would be expected in the case of a specialization by reduction.

The legs (fig. 13, plate ii) are strong and of variable length; the forelegs are the shortest and are used as foot-jaws for carrying food to the mouth. When at rest the forelegs project forward beneath the head. The coxæ are usually short (long and projecting beyond the lateral margins of the thorax in one genus) and are rarely appendaged. The femora vary from long, subcylindrical, to short, thick, subovoid; the tibiæ are usually shorter than the femora (sometimes as long, rarely longer) and slender, and are armed at the distal extremity with spines and sometimes, in the males, with special structures for holding the female. Both femora and tibiæ bear from a few to many short to long hairs; sometimes series of short, strong spines. The tarsi are 2-segmented, the distal segment with one (mammal-infesting forms) or two (bird-infesting forms) claws, the first segment of the tarsus is short and with or without one or two small lobes; the second segment is short (family Philopteridæ) or elongate and slender (family Liotheidæ) and bears a pulvillus between the claws.

Abdomen. The abdomen is flat, short, oval to long and slender, often differs in the sexes, especially in the shape and character of the posterior margin of the last segment, and is composed of 9 (sometimes apparently 8) or 10 segments. It may be almost naked or pretty thoroughly clothed with hairs, and bears almost always one to several short to long hairs in the posterior lateral angles of each segment, which angles sometimes project acutely. The hairs on the dorsal surface, as on the thorax, sometimes arise from small, circular, uncolored spaces, when they are said to be "pustulated." The last segment is variously elongate, short, with emarginate, truncate or convex posterior margin, which is evenly or unevenly fringed with short to long hairs. The lateral margins of thesegments are usually strongly chitinized, the chitin being sometimes translucent, but usually dark brown to black.

INTERNAL.—For our present knowledge of the internal anatomy of the Mallophaga we are indebted chiefly to Nitzsch, Kramer and Grosse. Among the points of special interest presented by the internal structure are the concentration of the nervous system and the differing types of crop in the two sub-orders.

Alimentary Canal (figs. 1 and 2, plate ii). The œsophagus of the Amblycera simply expands widely to form a crop; in the Ischnocera, the crop appears as a conspicuous diverticulum or lateral sac of the œsophagus. The crop often bears spines or teeth on its inner wall. There are two pairs of salivary glands, variously cylindric, clavate, sub-spheroid, reniform, or divided into many small cylindrical tubes. The stomach usually presents two forward-projecting sac-like expansions. There are four thread-like, unbranched, Malpighian tubules.

Genitalia (figs. 4 and 5, plate ii). In the male there are paired testes, two sperm-ducts uniting to form an ejaculatory duct, accessory glands and a protrusible penis, with chitinized, often elongated, side-pieces. The female has paired ovaries ("three pairs of ovarian tubes in Liotheidæ, five pairs in Philopteridæ"), two oviducts uniting before issuance, and a seminal receptacle (called by Nitzsch "Kittdruse," but by Kramer and Grosse a receptaculum seminalis).

Dorsal Vessel. Kramer found the heart of *Lipeurus* *jejunus* to be a long delicate tube with expanded, turnip-like, posterior extremity. The "wing-muscles" are greatly reduced. There are but four openings for the ingress of the blood, which is not rich in white corpuscles. Wedl was able to study the heart of *Menopon pallidum*, but Grosse could not succeed in making preparations showing the heart of *Tetraopthalmus chilensis* [= *Menopon titan*].

Respiratory System (fig. 6, plate ii). In *Menopon titan* I have found six pairs of abdominal spiracles (segments 3–8) and a pair of prothoracic spiracles. There are two large longitudinal trunks and one large transversal trunk (segment 4 of the abdomen) in *titan*.

Nervous System (fig. 3, plate ii). There are two head ganglia, the supra-œsophageal and the infra-œsophageal, and three thoracic ganglia lying close together. There are no abdominal ganglia, the hindmost thoracic ganglion sending back into the abdomen two large nerves, whose branches provide the abdominal viscera with nerves.

LIFE-HISTORY AND HABITS.

The Mallophaga have an incomplete metamorphosis. The eggs are elongate-oval, are fastened singly by some gluey substance to the vanes or barbs of the feathers, and the young issue by breaking off a circular cap or lid at the larger free end of the egg. The duration of the egg stage has not been determined for any species. A number of eggs of *Nitzschia pulicare* (host, the Chimney Swift, *Chætura pelasgia)*, collected by P. H. Rolfs (Ames, Iowa), and kept, some of them, "in a tight pasteboard box in his vest-pocket, the others enclosed in cotton-plugged tubes under a setting hen," incubated under these circumstances in from 13 to 20 days. The age of the eggs at time of collecting was not known. The young resemble the parents in essential characters; the noticeable differences are the comparatively larger head, the smaller, especially shorter, abdomen, and the absence or incompleteness of the markings, especially those of the abdomen. The color of the very young is always whitish; as they grow older chitinization follows and the brown and black colors appear (see plates). The number of moults or the duration of immaturity is not known for any species. I have observed nymphs (presumably in the stage preceding the final moult) which were fully as large as the adults of the same species. I have figured the immature stages for one or more species in nearly all the genera met with by me on the water and shore birds (see plates). In none of the monographic works is there any attention paid to the young. From the preceding brief account it is obvious that the life-history of the Mallophaga is as yet practically unknown.

Parasitism. The parasitic habits of the Mallophaga have been the subject of some little study, mainly directed to ascertaining whether or not the blood of the host ever forms a part of the food of the parasite. From the condition of the mouth parts and from repeated examination of the contents of the crop the food of the Mallophaga is affirmed to be the epidermal scales and the hair or feathers of the host. The conspicuous large, dark, pear-shaped blotch in the abdomen found in a majority of individuals examined is discovered, on careful examination, to be the crop and its contents, composed of bits of feathers showing through the semi-transparent body of the insect. In Nitzsch's drawings, illustrating the Insecta Epizoa, this food-filled crop appears in many of the individuals figured. Denny's figures also show the discolored crop. Of course such a "marking" is an evanescent one: immediately after a full meal it would be present; later, after digestion, it would be wanting. A few instances are recorded of the presence of blood in the crop, but it has been suggested, with much show of probability, that the blood was such as might not infrequently, because of wounds, be found by the parasite on the feathers, perhaps dried and hard. There is one instance, however, known to me among the habits of the parasites which cannot be so readily explained. *Menopon titan* var. *linearis* of the California Brown Pelican (*Pelecanus californicus*) is found commonly clinging to the inner surface of the gular pouch. The clinging is accomplished by the use of the mandibles, each parasite of the half dozen individuals which may be grouped together having its mandibles inserted in the skin of the pouch. The mandibles are not thrust in suddenly on touching the insect with the collecting forceps, but the insects are always, as far as observed, firmly lodged. Indeed some effective clinging would be necessary always to prevent the carrying away of the parasites by the water taken into the pouch of the pelican in feeding. In several instances a small region surrounding the parasites was raw and bloody. What is it that serves these parasites for food? Perhaps, of course, simply the epidermal scales of the inner wall of the pouch.

The abundance of certain species of Mallophaga, like *Menopon pallidum*, on domestic poultry causes the hosts much inconvenience and sometimes actual injury. The injury is done by the irritation of the skin of the host by the sharp-clawed feet of the hordes of parasites, rather than by any direct hurt through the feeding. After the death of the host, the parasites either attempt to leave the body, usually migrating slowly toward the head, or simply die on the body. The death of the parasites remaining on the body usually ensues in two or three days. I have observed the death of some in four or five hours, and, on the other hand, have collected live parasites from a bird skin seven days old. The death of the parasites can hardly be caused by starvation, in view of their feeding habits, but rather must be attributed to the lack of animal heat which they have been accustomed to during the life of the host.

Mallophaga which infest swimming and diving birds are not furnished with special contrivances for their pseudo-aquatic life. They, in fact, never come, necessarily, into contact with the water, living, as they do, at the roots of the feathers where the water can never penetrate, and where they have a constant and sufficient supply of air for the longest submergence possible to the host.

The origin of the parasitic habit among the Mallophaga and its influence on their structure are questions of much interest, but ones which cannot be touched on here.

Some of the phenomena of the relations of parasites to hosts, the migration of the parasites, and the influence of their peculiar habits on the rapid establishing of variations, are considered in the following paragraphs under the head of "Distribution."

DISTRIBUTION.

The Mallophaga are parasites which live for their whole life on the body of the host; only in rare instances are the insects to be found off the host's body. The common louse of the hen, *Menopon pallidum*, has been found walking on the roosts or elsewhere in the chicken houses. But the Mallophaga are not "stationary parasites" of that extreme type in which the organs of locomotion are lost; and the infesting of new hosts is accomplished by actual migration of individuals from one bird to another. It is obvious that for any one bird-species this migration may be readily accomplished: (a) from male to female, or *vice versa*, during copulation: (b) from parent to young, during the nesting season. In both of these cases there is actual contact of the hosts. If at other times in the life of the host it comes into actual contact with other birds of its own species migration of parasites can take place. Such cases must occur among birds of gregarious habits: the crowding together of gulls on small masses of floating sea-weed, or on masses of food, or on the rocks of the shore, must bring about actual contact of the bodies of the birds. But, as common observation shows, there are in the crowding groups of gulls individuals of different species. Thus in these cases there is possible a migration of parasites from one bird-species to another, these species in the case of the gulls being closely related ones—species belonging, in fact, to one genus. But on the "roosts" of maritime birds, the cliffs of the shore and the outlying rocks, birds of very different kinds sit huddled together. Along the rocky shores of Point Pinos on the Bay of Monterey, pelicans, cormorants and gulls gather in great numbers and perch side by side on favorite "roosts." It seems as if migration of parasites from one to another of these bird-species could here, and elsewhere under similar conditions, often be accomplished; and I have found *Lipeurus toxoceras*, described by Nitzsch from a cormorant, on both a cormorant and a pelican shot on this shore. Other cases of contact occur between birds of prey and their victims (I have noted a *Physostomum*, a genus confined normally to passerine birds, on a sparrow-hawk); and in those few groups of closely allied forms among which hydridization occurs, as with the ducks. Still other opportunities for accidental or normal contact between birds of different species will suggest themselves to the student.

The opportunities for migration so far referred to are sufficient to account for the spreading of a parasite species among individuals of its host species, and for the condition presented in cases like those of *Docophorus lari* and *Nirmus lineolatus* common to many species of gulls, and those of *Trinoton luridum* and *Docophorus icterodes* common to many species of ducks: cases where the birds are of gregarious habits, or where hybridization occurs.

But of those cases of a parasite common to two or more bird-species, one or more of which are Old World forms and the other or others New World forms, a further explanation is necessary. In this paper I ascribe to Mallophagous species described from specimens taken on birds of Europe or elsewhere not on the American continent specimens of twenty-two different species of Mallophaga taken on American birds. Examples of such occurrence are *Nirmus signatus* and *N. pileus* from the American Avocet *(Recurvirostra americana)* and described by Piaget and Nitzsch from specimens taken on the European Avocet *(Recurvirostra avocetta)*; *Docophorus pertusus* from *Fulica americana* (America), originally described from *Fulica atra* (Europe), and so on. In rare instances we find a bird-species common to both the Old World and the New World: certain birds of circumpolar range, as *Cepphus grylle*, and exceptional cases like that of *Puffinus major*, come in this category. The parasites of these birds will of course be common to America and to Europe. But such instances are rare. A few other cases may exist in which certain strong-flying maritime American and European or Asiatic birds may meet occasionally on some midoceanic island and a migration of parasites be effected. Such instances, also, are exceptional. The occurrence of a parasitic species common to European and American birds, which is not an infrequent matter (out of the sixty species of Mallophaga referred to in this paper as being taken on American birds one-third are referable to species previously described from European or Asiatic birds), must have another explanation than any yet suggested. This explanation, I believe, is, for many of the instances, that the parasitic species has persisted unchanged from the common ancestor of the two or more now distinct but closely allied bird-species. With the spreading of the ancestral bird-species, geographical races have arisen within the limits of the species which have, with time and isolation caused by newly appearing geographical barriers (due to geologic or climatic changes), come to be distinct species—species often distinguished only by superficial differences in color, etc. The parasites have remained practically unaffected by the conditions which have produced the differences among the birds; the temperature of the host's body, the feathers *as food*, all of the environment is essentially unchanged in its relation to the parasite. The parasitic species thus remains unchanged, while the first *Larus* species or *Anas* species becomes differentiated into a dozen or score of specific forms, all with a common parasite.

In substantiation of this explanation of a common possession of a parasitic species by Old and New World birds some examples may be referred to. As already mentioned, I have found on *Fulica americana* the same species of parasite, *Docophorus pertusus*, described by Nitzsch from specimens taken from the European *Fulica atra; Docophorus melanocephalus* taken by me on *Sterna maxima* is recorded by European authors from *Sterna caspia* and *S. cantiaca; Nirmus punctatus*, found by me on *Larus occidentalis* was described by Nitzsch from *Larus ridibundus* and has been found by Piaget on *Larus dominicans* from Chile and on *Larus ichthyætus* from the

Volgas: *Nirmus signatus* and *N. pileus* found by me on *Recurvirostra americana* were described by Piaget and Nitzsch respectively from *Recurvirostra avocetta*, the European Avocet; *Lipeurus ferox* taken by me on *Diomedea albatrus* is recorded by European writers from *Diomedea exulans*, *brachyura* and *melanophrys*; *Lipeurus forficulatus* taken by me on *Pelecanus erythrorhynchus* and *P. californicus* was described by Nitzsch from *P. onocrotalus*; and similarly the most of the twenty-two previously described species taken by me from American birds might be thus offered as examples. We have in all of these cases the common parasite occurring on the American representatives of the genus to which the original Old World host belongs. Looking now for the exceptions to this condition—namely, for instances where the known species when found on an American bird is found on one widely separated phyletically from the European host—we find no clearly defined instance of this condition, no instance where association during life or "straggling" after death of the host can be put aside as possible explanations of the presence of the parasite on the unexpected host.

There are to be noted other results of the influence on the taxonomy of the Mallophaga of the peculiar conditions of their parasitic life. While the uniformity and persistence of the conditions under which the life of the parasites is passed tends to preserve with little change the species types, the peculiar isolation, often pretty complete, of groups of individuals of a parasite species on individual birds of the host species and the consequent close breeding tend to foster and fix those inevitable slight variations always manifest in a comparison of offspring and parents, but under normal conditions held in check or lost (unless directly advantageous) by crossing among less closely related individuals. For example the individuals of a parasite species on a bird of long life and non-gregarious and monogamous habits, like an eagle, live very much the life of an isolated community. There must be many years of in-and-in breeding. It is like island life. The result is certain: the members of this isolated group will soon differ from the specific type in noticeable particulars. On the other hand, the conditions of life on this "island" are practically identical with the conditions on other similar "islands"—other eagles—inhabited by other individuals of the same parasite species, so there is no iufluence working to produce a wide divergence of the members of these various isolated groups of individuals of the same species. Now this isolation of groups of individuals is in some degree an incident of the life of all Mallophaga; in some instances it is considerable; in others, inconsiderable, but taken altogether a condition in the life of the whole order exerting an influence which has the readily recognizable result of creating a great number of small variations within species limits.

We have noted now two influences resulting from the peculiar habits of the Mallophaga which are somewhat opposed to each other. One influence, due to the uniform (as far as relation to parasite goes) conditions of the habitat, the body of the host, tending to preserve essentially unchanged the type-forms of the parasites; the other influence, due to the isolation of groups of individuals and the consequent close breeding, tending to foster and fix small variations. The results, manifest to any student of the group, are to render difficult the division of the order into distinct genera on account of the general similarity of structure, and to make difficult the definition of species on account of the many slight variations among the individuals from different bird individuals. While I believe myself able to refer specimens taken from American birds to a score of species described from specimens taken from European and Asiatic birds, in all of these instances there are slight but recognizable differences between the American specimens and the type-forms of the species (as well as I am able to make comparison, having only the drawings and descriptions of these type-forms to refer to).

The differences in relative abundance or rarity of the individuals of a species, and in the relative freedom or seriously infested condition of the hosts may be referred to briefly. Certain specific examples will serve to illustrate the various conditions. In the first place the host species may have several parasitic species as *Diomedea albatrus*, *Fulmarus glacialis* vars. *glupischa* and *rodgersii* and *Fulica americana*, each with six species of parasites; or the host species may have but one (very rarely) or two or three parasitic species infesting it, as with most of the ducks and gulls. A parasitic species may be constant in its appearance on the individuals of its host species, as *Docophorus lari*, almost certain to be found on any gull specimen shot, *Lipeurus celer*, which I found on twenty-nine out of thirty specimens of *Fulmarus glacialis* vars. *glupischa* and *rodgersii* examined, *Docophorus occidentalis* similarly found on twenty-nine out of these thirty Fulmars; or it may be found on but few individuals of the host species, as *Docophorus quadraticeps* found on one of fourteen specimens of *Fulica americana* examined, and *Nirmus præstans* found on two of fourteen specimens of *Sterna maxima* examined. There may be many individuals of a parasitic species always present on the body of the host, as with *Lipeurus celer* on the Fulmars, of which parasite I have collected nearly one hundred specimens from a single bird, and which is always abundantly present on its host; or the individuals may be few even though the parasite is a constant one, *i. e.*, almost always to be found on any specimen of the host examined. *Trinoton luridum* of the ducks is a good example of this constant presence in small numbers. There may be more than one species of the same genus of parasites on a single host, as *Lipeurus celer* and *Lipeurus varius*, both numerous on the Fulmars; but usually the different parasites of a host represent different genera, exemplified by the remaining four species of parasites of the Fulmars which belong to four other and different genera.

Finally, I may append to these desultory remarks concerning the distribution of the Mallophaga and the influence on their taxonomy of their peculiar habits of life a list of those bird hosts with their parasites, the examination of which has afforded the data for this paper. In preparing the list I have eliminated all instances of undoubted "straggling."

LIST OF HOSTS WITH PARASITES.

- Colymbus nigricollis californicus.
  - Docophorus lari.
    - kansensis.
  - Menopon tridens var. insolens.
- Urinator pacificus.
  - Docophorus colymbinus.
    - graviceps.
  - Oncophorus advena.
  - Menopon tridens var. pacificum.
- Urinator lumme.
  - Docophorus colymbinus.
    - lari.
    - graviceps.
  - Nirmus farallonii.
- Ceratorhina monocerata.
  - Docophorus acutipectus.
- Ptychorhampus aleuticus.
  - Docophorus montereyi.
  - Menopon loomisii.
- Synthliborhampus antiquus.
  - Docophorus montereyi.
    - atricolor.
  - Menopon loomisii.
- Brachyrhampus marmoratus.
  - Docophorus montereyi.
    - atricolor.
- Uria troile californica.
  - Docophorus calvus.
- Rissa tridactyla pollicaris.
  - Docophorus lari.
- Larus glaucus.
  - Docophorus lari.
- Larus glaucescens.
  - Docophorus lari.
  - Nirmus lineolatus.
  - Colpocephalum funebre.
  - Menopon infrequens.

- Larus occidentalis.
  - Docophorus lari.
  - Nirmus lineolatus.
    - punctatus.
- Larus argentatus smithsonianus.
  - Docophorus lari.
  - Nirmus lineolatus.
- Larus vegæ.
  - Docophorus lari.
  - Nirmus lineolatus.
- Larus californicus.
  - Nirmus lineolatus.
- Larus delewarensis.
  - Docophorus lari.
  - Nirmus lineolatus.
    - punctatus.
- Larus brachyrhynchus.
  - Docophorus lari.
  - Nirmus lineolatus.
- Larus canus.
  - Docophorus lari.
  - Nirmus lineolatus.
- Larus heermanni.
  - Docophorus lari.
  - Nirmus lineolatus.
    - felix.
- Sterna maxima.
  - Docophorus melanocephalus.
  - Nirmus præstans.
    - hebes.
    - lineolatus.
- Sterna forsteri.
  - Menopon tridens var. insolens.
- Diomedea albatrus.
  - Nirmus giganticola.
  - Lipeurus ferox.
    - densus.
  - Eurymetopus taurus.
  - Colpocephalum pingue.
  - Menopon navigans.
- Fulmarus glacialis glupischa.
  - Docophorus occidentalis.
  - Lipeurus celer.
    - varius.
  - Eurymetopus taurus.
  - Ancistrona gigas.
  - Menopon numerosum.
- Fulmarus glacialis rodgersii.
  - Docophorus occidentalis.
  - Lipeurus celer.
    - varius.
  - Eurymetopus taurus.
  - Ancistrona gigas.
  - Menopon numerosum.
- Puffinus opisthomelas.
  - Lipeurus diversus.
    - limitatus.
    - testaceous.
  - Giebelia mirabilis.
- Puffinus griseus.
  - Lipeurus diversus.
    - limitatus.
  - Giebelia mirabilis.
- Phalacrocorax dilophus albociliatus.
  - Docophorus lari.
  - Nirmus farallonii.
  - Lipeurus toxoceras.
- Phalacrocorax penicillatus.
  - Nirmus farallonii.
- Pelecanus erythrorhynchus.
  - Lipeurus forficulatus.
  - Colpocephalum unciferum.
  - Menopon titan var. impar.
- Pelecanus californicus.
  - Docophorus lari.
  - Lipeurus forficulatus.
    - toxoceras.
  - Colopocephalum unciferum.
  - Menopon titan var. linearis.

- Merganser serrator.
  - Docophorus icterodes.
  - Lipeurus temporalis.
    - squalidus.
- Merganser americanus.
  - Lipeurus squalidus.
  - Trinoton luridum.
    - lituratum.
- Anas boscas.
  - Docophorus icterodes.
  - Trinoton luridum.
    - lituratum.
- Anas americana.
  - Trinoton luridum.
- Anas carolinensis.
  - Trinoton luridum.
- Spatula clypeata.
  - Trinoton luridum.
- Dafila acuta.
  - Docophorus icterodes.
  - Trinoton luridum.
    - lituratum (?)
- Aythya americana.
  - Docophorus icterodes.
- Aythya affinis.
  - Docophorus icterodes.
- Charitonetta albeola.
  - Lipeurus squalidus.
- Oidemia deglandi.
  - Docophorus icterodes.
- Oidemia perspicillata.
  - Docophorus icterodes.
  - Lipeurus constrictus.
- Erismatura rubida.
  - Docophorus icterodes.
    - pertusus.
  - Trinoton luridum.
- Ardea egretta.
  - Colpocephalum laticeps.
- Fulica americana.
  - Docophorus pertusus.
  - Lipeurus picturatus.
    - longipilus.
  - Oncophorus advena.
  - Laemobothrium atrum.
  - Menopon tridens var. pacificum.
- Recurvirostra americana.
  - Nirmus signatus.
    - pileus.
  - Colpocephalum uniforme.
  - Menopon indistinctum.
- Charadrius squatarola.
  - Docophorus fuliginosus.
- Charadrius dominicus.
  - Nirmus orarius.
  - Colpocephalum timidum.

POSITION AMONG INSECTS.

What the position of the Mallophaga among insects is, is still a moot question, as indeed, strictly speaking, is the position of any one of the groups. The Mallophaga by reason of their habits have been constantly associated in entomological literature with the Pediculidæ. It is hardly worth while here to trace the Mallophaga in their tortuous path through the various schemes of insect classification from the times of Redi to the present day. It has not been until comparatively recent years that the facts of structure and life history upon which the classification of any group depends were known in the case of the Mallophaga. The classificatory attempts prior to that time were simply the results of conjecture.

Grouped for a long time with the Hemiptera, because the Mallophaga are, what the Pediculidæ, undoubted Hemiptera, are, external parasites of animals, the testimony of the biting mouthparts finally effected their removal to that heterogeneous group of insects, the order Pseudo-Neuroptera. Here they came to be associated, in all of these steps more and more nearly approximating the truth, with the Termites, Psocids, Perlids and Embids, these groups forming the suborder Platyptera. Dr. Brauer in 1885 broke up the order Pseudo-Neuroptera, and after this cataclysm our Mallophaga found themselves in company with the Termites and Psocids constituting the order Corrodentia. Finally under the impetus thus acquired in order-breaking many entomologists have gone further, and in the hands of these men the Mallophaga reach the standing of an independent order. The latest American text-book of entomology, Comstock's Manual of Insects, 1895, adopts this treatment of the group.

Whether a group of insects should be called an order or a suborder or what not is largely, of course, a matter of an author's attitude in matters classificatory. The point manifest in all this shifting about and gradual growth of ranking importance of the Mallophaga is that the group is one well removed from any other group of insects. The more the structure and life history of the bird-lice have been studied, the more difficult it has become to ally them closely with any other insects. The, at first glance, apparently simple and lowly structure of them is discovered by study to be the result of a specialization along the lines of parasitism. The simplicity of outer habitus, lack of wings, the rather Thysanuriform appearance are not the simplicity of a generalized, of a racial condition, but of a specialization, albeit in the line of reduction or degradation. With the simple general structure there goes a highly concentrated nervous system, greatly modified mouth parts, and curiously specialized antennæ.

The thorough study of the life-history, embryonic and postembryonic, is needed to throw more light on the position of the Mallophaga. Till such study is made, the present isolated position assigned the group, based on the known structure of the adult and on its habits, may be accepted as representing the consensus of authority.

CLASSIFICATION.

The Mallophaga were divided by Nitzsch into two families, the Philopteridæ, with filiform antennæ and without maxillary palpi, and the Liotheidæ, with capitate 4-segmented antennæ and maxillary palpi. The family Philopteridæ included two genera, *Trichodectes*, with 3-segmented antennæ and 1-clawed tarsi, and *Philopterus*, with 5-segmented antennæ and 2-clawed tarsi. The latter genus was subdivided into the five subgenera, *Docophorus*, *Nirmus*, *Goniocotes*, *Goniodes*, *Lipeurus*. The family *Liotheidæ* similarly included two genera, *Gyropus*, with 1-clawed tarsi, and *Liotheum*, with 2-clawed tarsi. The latter genus was subdivided into six subgenera, *Eureum*, *Læmobothrium*, *Physostomum*, *Trinoton*, *Colpocephalum* and *Menopon*. The two 1-clawed genera *Trichodectes* and *Gyropus* were found by Nitzsch exclusively upon mammals; all the other genera exclusively upon birds.

In essential identity the classification of to-day is that of Nitzsch; it differs in discarding the generic groups *Philopterus* and *Liotheum*, and in considering the Nitzschian subgenera as genera, and in the addition of several new genera.

That change by which the one-time subgenera of *Philopterus* are now put on equality with the genus *Trichodectes*, and similarly the subgenera of *Liotheum* on equality with *Gyropus*, seems to me ill-advised. The two genera found on mammals differ so radically and in so many ways from their related genera in each family that I believe their striking host and structural differences should be emphasized in the classification. I propose, therefore, in the light of the present position of the Mallophaga as an independent order of insects, to rank the Nitzschian families as suborders, and the Nitzschian genera as families, and the Nitzschian subgenera, the genera of present day writers, as genera. This will leave unchanged the present generic names and ranking, but will restore the expression, first indicated by Nitzsch in his generic rankings, of differences between the mammalian parasites and the avian parasites. This re-ranking, which is practically a return to classification of Nitzsch, finds expression in the keys and synopses which I have arranged to receive all of the genera so far recognized.

Although the Mallophaga include already nearly 1000 described species there are but few genera and these genera are difficult to separate. In other words, the whole group is a series of closely related and intergrading forms. The causes and conditions of this state of affairs I have already attempted to explain in the paragraphs under the head of "Distribution" *(antea)*. In this place the facts of this close inter-relation come home to us in the attempt to arrange keys for the separation of the genera. I found trouble, when beginning the study of the Mallophaga, in distinguishing by the published keys certain genera: whether a Philopterid parasite was a *Docophorus* or a *Nirmus*, or whether a Liotheid parasite was a *Menopon* or a *Colpocephalum*, were questions not definitely answered by the key. In introducing into the key the genera which have been described since the making of the key used in the European monographs, I find naturally increasing difficulties: so I have accompanied the key with a synopsis of all of the described genera, calling attention to the characters which go to give any genus its peculiarly characteristic appearance. With the key and the diagnosis I hope that any genus can be satisfactorily determined. For definitions of the terms used in referring to various structures of the Mallophaga, see the Terminology, following the synopsis.

KEY TO THE SUBORDERS.

A. With filiform 3- or 5-segmented antennæ, and no labial palpi. Suborder Ischnocera.

AA. With clavate or capitate 4-segmented antennæ, and 4-segmented labial palpi. Suborder Amblycera.

KEY TO THE GENERA OF THE SUBORDER ISCHNOCERA.

A. With 3-segmented antennæ; tarsi with 1 claw; infesting mammals (family Trichodectidæ). Trichodectes N.

AA. With 5-segmented antennæ; tarsi with 2 claws; infesting birds (family Philopteridæ).

- B. Antennæ similar in both sexes.
  - C. Front deeply angularly notched. Akidoproctus P.
  - CC. Front convex, truncate, or rarely with a curving emargination, but never angularly notched.
    - D. Species broad and short, with large movable trabeculæ (at the anterior angle of antennary fossa).
      - E. Forehead with a broad transverse membranous flap projecting beyond lateral margins of the head in the male, barely projecting in female. Giebelia Kellogg.
      - EE. Without such membranous flap. Docophorus N.
    - DD. Species elongate, narrow; with very small or no trabeculæ. Nirmus N.
- BB. Antennæ differing in the two sexes.
  - C. Species wide, with body elongate-ovate to sub-orbicular.
    - D. Temporal margins rounded; last segment of abdomen roundly emarginated; antennæ of male without appendage, third segment very long. Eurymetopus Tasch.

DD. Temporal margins usually angulated; last segment of abdomen convex, rarely angularly emarginated with two points.

E. First segment of antenna of male large, sometimes with an appendage; third segment always with an appendage. GONIODES N.

EE. First segment of antenna of male enlarged, but always without appendage; third segment without appendage; last segment of abdomen always rounded behind. GONIOCOTES N.

CC. Species elongate, narrow, sides sub-parallel.

D. Third segment of antenna of male without an appendage. ORNITHOBIUS Denny.

DD. Third segment of antenna of male with an appendage.

E. Front deeply angularly notched.
BOTHRIOMETOPUS Tasch.

EE. Front not angularly notched.

F. Antennæ and legs long; a semicircular oral fossa.
LIPEURUS N.

FF. Antennæ and legs short; oral fossa narrow, elongate, extending as a furrow to the anterior margin of the head. ONCOPHORUS Rudow.

KEY TO THE GENERA OF THE SUBORDER AMBLYCERA.

A. Tarsi with 1 claw; infesting mammals (family Gyropidæ).
GYROPUS N.

AA. Tarsi with 2 claws; infesting birds (except *Boopia?*) (Family Liotheidæ.)

B. Ocular emargination distinct, more or less deep.

C. Forehead rounded, without lateral swelling; antennæ projecting beyond border of the head. COLPOCEPHALUM N.

CC. Forehead with strong lateral swellings.

D. Antennæ projecting beyond border of the head; temporal angles projecting rectangularly; eye large and simple.
BOOPIA P.

DD. Antennæ concealed in groove on under side of the head; temporal angles rounded, or slightly angular; eye divided by an emargination and fleck.

E. Mesothorax separated from metathorax by a suture.
TRINOTON N.

EE. Meso- and metathorax fused; no suture.
LÆMOBOTHRIUM N.

BB. Ocular emargination absent or very slight.

C. Sides of the head straight or slightly concave, with two small laterally-projecting labral lobes. PHYSOSTOMUM N.

CC. Sides of the head sinuous; forehead without labral lobes.
  D. Body very broad; metathorax shorter than prothorax. EUREUM N.
  DD. Body elongate; prothorax shorter than metathorax.
    E. Ocular emargination filled by a strong swelling; sternal markings forming a quadrilateral without median blotches. NITZSCHIA Denny.
    EE. Ocular emargination without swelling, hardly apparent or entirely lacking; median blotches on sternum.
      F. Very large; with two 2-pointed appendages on ventral aspect of hind-head; anterior coxæ with very long lobe-like appendages. ANCISTRONA Westwood.
      FF. Small or medium; without bi-partite appendages of hind-head. MENOPON N.

SYNOPSIS OF MALLOPHAGA.

Suborder ISCHNOCERA.

With the antennæ filiform, 3- to 5-segmented, sometimes differing in the sexes; no labial palpi.

Family TRICHODECTIDÆ.

Characters of the single genus.

Genus *Trichodectes*. Infesting mammals; tarsi with one claw; antennæ 3-segmented, in some species differing in the sexes; legs thickly beset with hairs; female with a pair of bent appendages on the sides or ventral surface of the eighth abdominal segment.

Family PHILOPTERIDÆ.

Infesting birds; tarsi with two claws; antennæ 5-segmented, not lying in an excavation on the under side of the head, but always projecting far beyond the sides of the head.

Genus *Docophorus* Nitzsch. (Plates iii and iv.) Body short and broad, head usually as wide across the temples as long, front broadly truncate or convex or slightly concave, rarely with a curving emargination; clypeus with distinct suture, often with a broad uncolored anterior and lateral margin: signature usually shield-shaped, with acuminate posterior angle: prominent movable trabeculæ reaching to or beyond end of the first antennal segment; antennæ similar in the sexes, with thick first segment, segment 2 the largest, and segments 3–5 subequal. Thorax with meso- and meta-segments completely coalesced; legs rather flattened, insertions approached; front legs smallest and usually concealed beneath the head. Abdomen usually oval, of nine segments of about equal length; last segment of male rounded, of female small and emarginated. Color and markings whitish on buffy ground, markings clear light brown to opaque dark brown, and even to black; head with antennal occipital bands; thorax with lateral borders; abdomen with lateral bands, darkest, and lateral transverse blotches, longest in male where they nearly meet on the median line. This genus has been found on birds of all the larger groups except the Gallinæ.

Genus *Giebelia* Kellogg. (Plate xi.) General characters of *Docophorus;* forehead (labrum?) with a broad transparent membranous flap extending across the ventral surface of head and projecting conspicuously beyond lateral margins of head in the male and but slightly in the female; rectangular anterior angles of temporal region with large eye in the angle. Found, as yet, only on the genus *Puffinus* (Shearwaters).

Genus *Nirmus* Nitzsch. (Plates v and vi.) Body usually narrow and elongate, though not actually long, the species rarely exceeding 3½ mm. in length; the antennæ similar in the sexes: clypeal suture ordinarily indistinct; the trabeculæ wanting, or if present very small, inconspicuous and not movable (rarely large and feebly movable): other characters approximately those of *Docophorus*. Found on all kinds of birds.

Genus *Akidoproctus* Piaget. Body slender, elongate, Nirmoid in general shape; front of clypeus with a deep median rectangular notch, clypeal suture not distinct; antennæ similar in the sexes, situated distinctly before the middle of the head, short; prothorax rectangular, meso- and metathorax fused, widest (except in one species) in front; abdomen with broad sutures and a longitudinal median uncolored line; slightly mesad of the lateral band there runs parallel with it on each side a second narrow transparent lateral band; the two last segments in both sexes abruptly narrower than the seventh and conical. But four species belonging to this genus have been described.

Genus *Eurymetopus* Taschenberg. (Plate xi.) Body broad, *Docophorus*-like; antennæ differing in the sexes; clypeus broad, truncate; anterior angles of antennary fossæ produced and pointed; metathorax short, broad, without indication of constriction between meso- and meta-segments; coxæ not projecting beyond lateral margins of thorax; posterior segment of abdomen broadly round with slight rounding emargination, deeper in female than in male. But three species of this genus are yet known, of which one is so aberrant that it should probably be made the type of a new genus.

Genus *Goniodes* Nitzsch. Body large and broad; head usually with temporal margin and outer occipital margin angulated; head often varying in form in the sexes; antennæ differing in the sexes, third segment of male always with appendage, first segment enlarged and sometimes with appendage; prothorax usually trapeziform, metathorax much larger, rounded laterally; abdomen usually broadly oval, lateral band broad. Color usually whitish or pale yellowish, the blotches tawny, the bands dark brown to black. Found only on Gallinaceous birds.

Taschenberg has given sub-generic names to certain pretty distinctly separable groups of species. These sub-genera may be distinguished by the following table:

- A. With rounded temporal and occipital corners. No appendage on third segment of male, or a very small one. *Stronglyocotes.*
- AA. With angulated temporal and occipital corners.
  - B. Antenna of male with segments 4 and 5 very short, third segment with appendage. Temporal angles weak. *Coloceras.*
  - BB. Segments 4 and 5 of male antenna of ordinary size. Temporal angles distinct.
    - C. Segment 3 of male antenna with appendage; segment 1 long and thick and sometimes with appendage. *Goniodes s. str.*
    - CC. Segment 3 of male antenna without appendage (distal angle slightly produced); segment 1 without appendage. *Rhopaloceras.*

Genus *Goniocotes* Burmeister. General characters those of *Goniodes*, but usually smaller species, and with antennæ of male never appendaged; the antennæ differ but little in the sexes, the male sometimes having the first and second segments larger than in the female. The species of this genus are found on gallinaceous and columbine birds.

Genus *Ornithobius* Denny. Body elongate, narrow; head broad, rather quadrangular; clypeus with a frontal emargination expanded within so that the bounding sides are pincer-like in shape, the points almost meeting, thus nearly inclosing the emargination; the antennæ arise far in front of the middle of the head, and differ in the sexes; the antennæ of the male have the first two segments larger than the others, and the third, which is diagonally truncated and expanded distally, is with or without an appendage; the abdomen has two parallel lateral bands on each side, and the last segment of the male is pointed, of the female rounded or truncate. Only three species of this genus have been found, all on swans.

Genus *Bothriometopus* Taschenberg. Body elongate, sides subparallel; head about as long as wide, with swelling rounded temples: clypeus including most of the forehead: without antennal bands, and with a deep angular frontal emargination or notch (much as in *Akidoproctus*); antennæ situated in front of middle of head and differing in the sexes; the antenna of male long, first segment thickened and as large as all the others together and with a pointed projecting process: antenna of female short, first two segments of equal length: legs very long, abdomen of both sexes with posterior segment 2-pointed behind. But one species has been described, taken from *Palamedea*.

Genus *Lipeurus* Nitzsch. (Plates vii, viii, ix and x.) Body long, slender; head usually narrow, elongate, with rounded temporal margins; clypeus usually with distinct signature, and with distinct or indistinct suture; antennæ differing in the sexes, the male antenna with first segment long and thick, rarely with appendage; third segment has an appendage, which is sometimes small and inconspicuous; the female antenna is simply filiform with first segment the thickest and second segment the longest; metathorax usually at least twice as long as the prothorax, often showing a lateral constriction indicating the line of fusion of meso- and meta-segments; the legs arise far apart, the proximity of the coxal cavities of the second and third pairs of legs to the thoracic margins being one of the diagnostic characters of the genus; the coxæ are long and project conspicuously beyond the lateral margins of the thorax; abdomen elongate and narrow, with segments 8 and 9 fused. Body color, white to brown, with conspicuous markings of pale brown to black. There are many described species and they have been found on all kinds of birds, being especially common on swimmers and rare on passerine birds.

Genus *Oncophorus* Rudow. (Plate xi.) (The generic name *Oncophorus* was proposed by Rudow for a species which has since been transferred to another genus, *Eurymetopus*, but Piaget, retaining the generic name, has grouped under it a number of species presenting the characters following. This genus "*sert de transition naturelle entre les genres Docophorus et Nirmus d'une part et les genres Goniodes et Lipeurus d'autre part.*") Usually small, 2 mm. being a maximum length among the known species; varying from broad to slender; head conical, clypeus with or without distinct suture, with or without signature; antennæ differing in the sexes, the male antenna longest, and the first three segments with or without appendages; prothorax but little shorter than the metathorax; legs short like those of *Nirmus;* color generally dark brown. But few species (eleven) so far described.

Suborder AMBLYCERA.

With the antennæ clavate or capitate, 4-segmented, and with filiform 4-segmented labial palpi.

Family GYROPIDÆ.

Characters of single genus.

Genus *Gyropus* Nitzsch. Infesting mammals, tarsi with one claw; temples produced into angulated processes; mouth parts on the frontal margin of the head; size, small from .7 to 1.2 mm.

Family LIOTHEIDÆ.

Infesting birds (see *Boopia!);* tarsi with two claws; the 4-segmented antennæ lying, when not outstretched, in an excavation on the under side of the head.

Genus *Colpocephalum* Nitzsch. (Plate xii.) Body varying in size from very small (1 mm.) to large (3 mm.), elongate, oval or elliptical; head usually wider than long with distinct ocular emargination; eye located in the posterior portion of the emargination, simple or semi-divided by an emargination: temples usually swollen or "winged" with rounded or nearly straight lateral margin; just behind the eye and along the anterior margin of the temple a series of fine short hairs, the "ocular fringe"; the 4-segmented labial palpi extending beyond the lateral margins of the head; the 4-segmented antennæ with first segment short, cylindrical, second, conical, truncated, third goblet-shaped, fourth cylindrical or ovoid usually obliquely truncated; prothorax usually longer than metathorax, with produced lateral angles and bearing a pale or uncolored transverse line which does not extend into the lateral angular regions; mesothorax indicated by a slight constriction and sometimes by an uncolored transverse line across the metathoracic segment; first segment of tarsus short, with a small flat lobe or plate, second very long and slender; abdomen with nine segments, the posterior one differing in the sexes, with distinct dorsal and ventral posterior borders. Color whitish or yellowish with pale to dark brown markings. The genus contains many species, found on all birds except ostriches.

Genus *Boopia* Piaget. The single species upon which this genus is established by Piaget was found by him in company with individuals of *Colpocephalum truncatum* on *Phascolomys fossor*, a wombat! Can these true Liotheid forms have been stragglers from some bird host to this mammalian host? The characters of the genus, as shown by the one species, are: Body about 2 mm. long; head rounded in front, ocular emargination wide but shallow, situated more anteriorly than in other Liotheidæ; eye hemispherical, very large, located in the anterior portion of the ocular emargination; temples angularly produced; the palpi passing the margins of the head by three segments; the antennæ with second segment subspherical, third pedunculated, fourth the largest; thorax much as in *Colpocephalum;* legs, long and hairy; abdomen of eight (?) segments. The middle of the head and borders of the abdomen yellowish; the rest of the head, thorax and abdominal blotches tawny.

Genus *Trinoton* Nitzsch. (Plate xiii.) Body large, from 2 to 6 mm. long; head, triangular, with rounding angles, with projecting rounded temples, and convex arcuated occipital margin; antennæ, short and concealed, palpi projecting beyond lateral margins of forehead; eye prominent and emarginated, appearing double; the whole thorax very long, in one species larger than the abdomen; mesothorax separated from metathorax by distinct suture (the diagnostic character of the genus); legs long, strong and haired; first segment of tarsus short, with two narrow and acute lobes, second long with two small lobes near the extremity; abdomen elongate oval, nine segments, the posterior segment being rounded behind in the female and trilobed in the male. Color whitish, with brown or reddish brown blotches and black bands.

Genus *Læmobothrium* Nitzsch. (Plate xiv.) Large species, from 5 to 10 mm. long; body elongate, rather slender; head usually longer than wide, truncate or emarginate in front; temples but little swollen with occipital corners angulated; occipital margin deeply concave, with a neck-like prolongation: a large and distinct oral fossa; the mesothoracic suture obsolete, although usually faintly indicated; metathorax separated from abdomen by distinct suture, but of general appearance of an abdominal segment; legs long and strong: first segment of tarsus short with a large lobe; second segment very long and without lobes; abdomen elongate, tapering posteriorly; the ninth segment rounded or truncate. Color varying from tawny to blackish brown on a whitish ground. Found on birds of prey, and certain water birds.

Genus *Physostomum* Nitzsch. Species large, from 2½ to 5 mm. long; body elongate: head broadly conical, straight or a little concave on the lateral margins, without ocular emarginations; broad and usually truncate or flatly convex in front; temporal corners angulated: the under side of the forehead with two small motile muscular lobes projecting slightly beyond the lateral margins, characteristic marks of the genus; palpi prominent: antennæ very short, always concealed in their furrows: thorax longer than the long head: meso- and metathorax completely fused, the posterior width of the metathorax same as anterior width of first segment of abdomen: legs robust, little colored and with few hairs: first segment of tarsus with a small double lobe: second segment rather short. Abdomen elongate elliptical, ninth segment broad and rounded. Color clear pale brown to yellowish, abdomen with lateral bands. The species are few and have been found as yet exclusively on passerine birds.

Genus *Eureum* Nitzsch. Body large, head and abdomen very wide, and metathorax very short: head without ocular emargination and with temples very much enlarged and rounded; antennæ concealed in their cavities; the palpi never projecting beyond lateral margins of the head; thorax about same length as the head; prothorax concave before and behind; the shorter metathorax of the same form as first segment of abdomen; legs long, second segment of tarsus very long; abdomen with acute posterior angles of segments, and hairy. But two species are known, one found on a swallow and the other on the chimney swift.

Genus *Nitzschia* Denny. Body of medium size, about 2 mm. long; head with small ocular emargination, and a slight but distinct emargination of the lateral margin in front of the ocular emargination, being about where the projecting palpi pass the margins of the head; head wider than long, temples expanded and angulated in front and behind; antennæ short and entirely concealed in their cavities; palpi rather long and projecting beyond margins of the head; prothorax hexagonal with obtuse angles; the mesothoracic suture slightly indicated on the lateral margins; legs long and only slightly colored, first tarsal segment very short with a small acute lobe, second segment larger; abdomen similar in the sexes, obovate, widening posteriorly, with broad lateral bands. Color tawny, blotches ferrugineous, and lateral bands dark reddish brown. Only one species certainly known; found only on the chimney swift.

Genus *Ancistrona* Westwood. (Plate xiii.) Body very large, 6 mm. long and 2½ mm. wide; head crescentic, without ocular emargination; with two 2-pointed strongly-chitinized processes on ventral aspect of hind head projecting backward beyond occipital margin of the head; antennæ concealed in ventral cavities; the lateral palpi short. Prothorax as large as the head; the metathorax like an abdominal segment; the coxæ of the front legs bear a long appendage or lobe; abdomen of ten segments. Only a single species certainly known; found on the Fulmars.

Genus *Menopon* Nitzsch. (Plates xiv and xv.) Body small to large, varying from 1 mm. to 5 mm. in length; of general shape and character of *Colpocephalum* (from which it is sometimes hardly distinguishable), but the ocular emargination is wanting or is slight; an ocular emargination is often present and plainly visible inferiorly, but superiorly there is a membrane which extends across it; head always widest across the temples; the antennæ short, first two segments truncated, conical, the second rarely with a short appendage, the third usually pedicellated and goblet-shaped, receiving the spherical or ovoid or cylindrical fourth into this open mouth; the fourth is always the largest of the four segments; mesothorax fused with metathorax; legs long, first segment of tarsus very short with a lobe of variable form, second long with a small chitin plate often swollen at its extremity; abdomen differs in the sexes, both as to general form and specially as to the last (ninth) segment; posterior border of ninth segment of female fringed with fine hairs which are not present in male. Color whitish or yellowish with darker markings. This is a very large genus, infesting all kinds of birds.

TERMINOLOGY.

By means of the following definitions and accompanying figures the student will be enabled to understand, it is hoped, the special descriptive and structural terms used in the synopses, keys and descriptions of Mallophaga. Most of these terms are the English equivalents, as nearly as possible, of the terms used in the French and German monographs. A few of them are here first used.

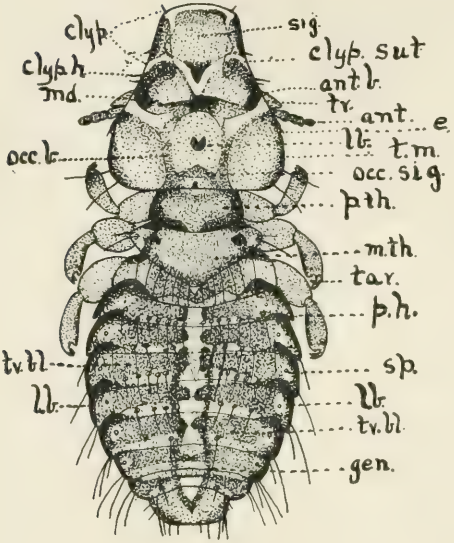


Fig. 1. *Docophorus fuliginosus* Kell., male; *clyp.*, clypeus; *clyp. sut.*, clypeal suture; *clyp. h.*, clypeal hair; *sig.*, signature; *md.*, mandibles; *ant.*, antenna; *tr.*, trabecula; *e.*, eye; *occ. b.*, occipital band; *ant. b.*, antennal band; *lb.*, chitinized part of labium; *occ.sig.*, occipital signature; *pth* , prothorax; *mth.*, metathorax; *tar.*, tarsus; *p. h.*, "pustulated" hairs; *tr. bl.*, transverse blotch; *l. b.*, lateral band; *sp* , spiracle; *gen.*, genitalia.

Antennal Appendage (fig. 2). A projecting process on the first or third segments of the antennæ of the males of certain genera. This appendage may be simply a slight projection of one side of the distal extremity of the segment, or may be long and curving, and may arise from the middle of the segment.

Antennal Bands(*ant.b.*, fig. 1). Pale to dark-colored chitinous bands extending along the lateral margins of the forehead, interrupted and divided into two parts when the clypeal suture is distinct, sometimes divided into three parts (*Nirmi nigropicti*).

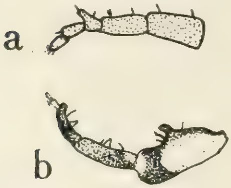


Fig. 2. *a*, antenna of *Lipeurus baculus* ♂; *b*, antenna of *Lipeurus ferox* ♂.

Antennary Furrows (*ant. f.*, fig. 3). The furrows on ventral aspect of head of members of the Liotheidæ in which the antennæ lie, concealed from dorsal view.

Clypeal Hairs (*clyp. h.*, fig. 1). Usually short, fine hairs on the margins, frontal and lateral, of the clypeus.

Clypeus (*clyp.*, fig. 1). That part of the head in front of the clypeal suture; prominent throughout the group.

Clypeal Suture, or, in descriptions of the head, the *suture* (*clyp. sut.*, fig. 1). The distinct or indistinct suture separating the clypeus from the rest of the head; when distinct, appearing as a narrow uncolored line; when indistinct, usually recognizable on the lateral margins of the head by a small emargination.

Forehead That part of the head in front of the mandibles and antennæ.

Genital Blotch. Abdominal markings on the under side of the last segments of the female; sometimes single and median, sometimes paired and lateral.

Genitalia (*gen.*, fig. 1). The colored chitinized parts of the genitalia, often showing through the surface of the body.

Hind-head. That part of the head behind the mandibles and antennæ.

Inter-coxal Line (*i. c. l.*, fig. 4). A sternal marking consisting of a colored line or narrow band running transversely between two coxæ of the same side.

Lateral Bands (*l. b.*, fig. 1). The dark or transparent lateral margins of the abdomen.

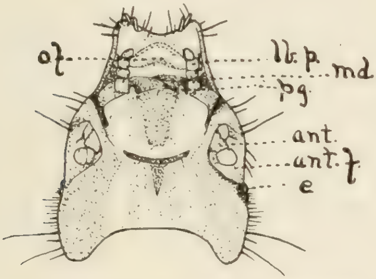


Fig. 3. Under side of head of *Læmobothorium similis* Kell.; *of.*, oral fossa; *lb. p.*, labial palpus; *md.*, mandible; *pg.*, paraglossa; *ant.*, antenna; *ant. f.*, antennary furrow; *e.*, eye.

Labial Palpi (*lb. p.*, fig. 3). The 4-segmented labial palpi, present only among the Liotheidæ; usually projecting laterally beyond the lateral margins of the forehead.

Metathorax (*m. th.*, fig. 1). As the meso- and metathorax are in most genera of the order fused into a single segment; the term metathorax used when no mention is made of the meso-thorax is intended to apply to this compound segment.

Occipital Bands (*occ. b.*, fig. 1). Pale to dark-colored chitinous bands extending from the occipital margin forward to the mandibular rami.

Occipital Margin. The posterior margin of the head.

Ocular Bands. Bands extending from the eyes to the anterior extremities of the occipital bands.

Ocular Blotch. A colored blotch contiguous to the inner margin of the eye.

Ocular Emargination. An emargination of the lateral margin of the head, the eye lying in the emargination though near the posterior end of it.

Ocular Fleck. A small intensely black spot of pigment in the eye.

Oral Fossa (*o. f.*, fig. 3). A furrow lying in front of the mandibles.

Ocular Fringe. A series of closely set small hairs on the posterior half of the inner margin of the ocular emargination and extending to and sometimes on the temporal margin; especially characteristic of *Menopon* and *Colpocephalum*.

Pustulated Hairs (*p. h.* fig. 1). Hairs rising from uncolored (unchitinized) spaces.

Signature (*sig.*, fig. 1). A colored blotch on the clypeus, usually with a posterior acuminate point. The *occipital signature* is a usually subcircular colored blotch on the under surface of the hind-head, often showing through above.

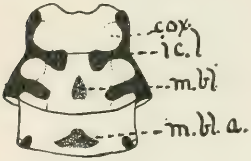


Fig. 4. Ventral aspect of thorax and first abdominal segment of *Nirmus præstans* Kell.; *cox.*, coxa; *i. c. l.*, intercoxal line; *m. bl.*, median sternal blotch; *m bl a.*, median blotch of abdominal segments.

Sternal Markings (fig. 4). Colored blotches and lines on the ventral aspect of the thorax.

Temporal Margins (*t. m.*, fig. 1). The lateral margins of the hind-head.

Trabeculæ (*tr.*, fig. 1). Two processes, one on each side of the head, projecting laterally from the anterior angle of the antennary fossa; largest and movable in *Docophorus*.

Transverse Blotches (*tv. bl.*, fig. 1). The colored blotches, one on each lateral half of each abdominal segment.

Collections Made.

The specimens which I have had for study have been collected by me from newly-killed birds, or from freshly-made skins under the following circumstances:

(a) A collection made at Lawrence, Kansas, during the years 1889–1892, exclusively from newly-killed birds, the birds determined by me, and in most cases collected by me.

(b) A collection made by me at the Hopkins Seaside Laboratory on the shore of the Bay of Monterey, California, during the two weeks from Dec. 17, 1894, to Jan. 1, 1895, from newly-killed birds and from the fresh skins lying in cotton forms on tables in the laboratory; the birds were collected on the bay by Mr. Leverett M. Loomis, Curator of Birds of the California Academy of Sciences, and were determined by him.

It will always be of interest to the student of these parasites to know the exact conditions attending the collection of any set of specimens in order that he may weigh fairly the probable accuracy of the host determinations and the value of any statements as to relative abundance of the individuals of a species, or of the constant or casual occurrence of any parasite species on the individuals of its host species.

A large number of the specimens upon which the monographs of the order are based were collected from the dried skins of birds in various museums. Piaget has found the museum of Leyden a fertile field for collecting. But it is evident that collecting under such circumstances makes uncertain any generalization regarding the abundance of individuals on the host, and the constancy of occurrence of any certain parasite species on any certain bird species. There is also much likelihood of "straggling" and little opportunity to prove or disprove it. On the other hand, in collecting from the newly-killed birds one can practically determine the total parasitic fauna of any bird specimen; and, where a large series of specimens of one bird species is obtained, definite conclusions as to the constant or casual occurrence of a parasite species upon its host can be attained. The collection of immature specimens is practically restricted to collectors from newly-killed specimens because the tender, unchitinized body of the young insect shrivels soon after death; thus the immature insects are rarely found on dried skins. This may account for the absence of references in the European monographs to the immature stages of any of the described species.

METHODS OF COLLECTING AND PRESERVING.

The methods of collecting are simple. The parasites do not leave the body quickly after the death of the host, so if there is no opportunity to take them from the host in the field immediately after shooting, they may be collected after the dead birds are brought to the laboratory or museum. Most of my collecting has been done in connection with the collection of the birds for museum purposes. The parasites frequent all parts of the body of the host, but after death of the host are especially to be sought about the lores and base of the bill. Here they seem to congregate, and while sometime after death of the host many parasites leave the body others will stop their traveling at the base of the bill, and rather than leave the body will fasten themselves by claws or mandibles to the short stiff feathers of this region and die there. The death of the parasites which remain on the body after death of the host takes place in from four or five hours to seven days. In most cases all of the parasites are dead at the end of two or three days. It is evident, in face of the fact that after death of host many parasites leave the body, that much care must be taken to prevent "straggling," i. e., parasites from one bird getting upon some other bird which may be conveniently near. In the game-bag each bird should be well wrapped in paper, or, as is common with collectors, placed in a paper cone head downwards.

In addition to the examination of newly-killed birds, the examination of freshly-made skins may be made, or even of old and dry skins. On these skins the dried bodies of the dead insects, their external appearance (in case of adults) little modified because of their firm chitinous covering, may be found attached by the mandibles to the feathers.

The collected insects should be kept in alcohol in vials. I put all of the parasites taken from one bird specimen in a single vial, giving this vial an accessions number and putting into it a label bearing name of locality, date and name of bird. Later, with opportunity, the specimens in any one vial may be assorted into species putting each species in a vial by itself and giving this vial the same accessions number as the original vial and in addition a sub-number or letter. In my catalogue of accessions there are entered under each accessions number the sub-numbers or letters with specific name of the parasites when determined. By this plan, any specimen of parasite can be traced at any time to the individual bird from which it came, and statistics of abundance on the host, of number of individuals of a single species, or of the constant or casual occurrence of a parasite species on a host species can be compiled. Also, the parasitic faunæ of different specimens of the same bird-species from different localities can be critically compared.

The alcohol modifies the specimens but little; their hard chitin covering prevents appreciable shrinking, and the colors are due chiefly to the excess or scantiness of chitinization in different parts of the body, a coloration not much affected by alcohol. Specimens intended for dissection can be well preserved in soft condition in a five per cent. solution of chloral hydrate.

DESCRIPTIONS OF NEW SPECIES.

Docophorus calvus n. sp. (Plate iii, fig. 1.)

A single female, taken on a California Murre, *Uria troile californica* (Bay of Monterey, California).

Description of female. Body, length 1.7 mm., width .8 mm.; short, broad, small, with golden brown markings, darker on margins, almost without hairs.

Head, length .53 mm., width .56 mm., thus being slightly wider than long; conical, with uncolored frontal part of clypeus slightly expanded and feebly emarginate; suture distinct; lateral margin of head in front of suture slightly concave; temporal margins convex with two hairs, and one hair in the prominent eye; occipital margin straight; trabeculæ large; signature colored, posterior margin with darker-colored acuminate point, anterior margin parallel with front margin of clypeus, i. e., emarginate; antennal bands distinctly colored and continued in front of suture, and bending in at posterior ends; behind these bent-in ends a diagonally transverse, uncolored line; occipital bands distinct; temporal margins colored.

Prothorax small, short, much narrower than the head; angled behind, with a slight, rounding prominence at posterior lateral angles bearing a single hair; colored, paler in the center. Metathorax short, angled behind, with sides produced and obtusely rounded, bearing one long hair; whole segment strongly colored.

Abdomen broadly elliptical; first segment wholly colored, segments 2–7 with a strong lateral blotch, irregularly triangular, pointed inwardly, with clear stigmatal spot, with uncolored posterior angles, and with one or two hairs arising from extreme posterior lateral point of colored blotch; eight segment wholly colored; ninth uncolored, rounded, with only very small hairs; central space of abdomen uncolored; a rectangular genital blotch with backward projecting posterior angles showing through on sixth and seventh segments.

Docophorus fuliginosus n. sp. (Plate iii, fig. 2.)

A few specimens from a Black-bellied Plover, *Charadrius squatarola* (Lawrence, Kansas), and a single male from a specimen of the same bird-species shot near Palo Alto, California. The new species belongs to the group *rotundati* (with convex or truncate clypeus) of Piaget's super-group *latitemporales*, which includes the *Docophori* of the shore birds. This group closely resembles the group *pustulosi* of the Terns, and this species from *Chara-*

drius very closely resembles the common *melanocephalus* of the Terns.

Description of the male. Body, length 1.62 mm., width .65 mm.; head and thorax smoky golden brown, abdomen dark brown with black markings.

Head, length .60 mm., width .53 mm.; front convex with a narrow uncolored border, and a short hair in each anterior angle; one short, marginal hair in front of the distinct suture, and two behind it; trabeculæ medium; eye inconspicuous, with a short hair; temporal margins with two hairs; occipital margin straight, bare; signature shield-shaped, pale, with acuminate posterior point darker colored; quadrangular space in anterior part of signature slightly darker colored than rest of signature; angulated antennal bands, their continuations in front of the suture as narrow marginal borders, the diverging occipital bands and the marginal temporal borders dark brown; also a narrow occipital border not extending to the sides of the head and interrupted medially.

Prothorax, short, with slightly diverging sides and flatly convex posterior margin; posterior angles with a single hair; color smoky golden brown, with a dark brown lateral border, extending around the posterior angles, and a little way along the posterior margin. Metathorax short, broad, with widely diverging short sides, and broadly parabolic posterior margin thickly set with a series of pustulated hairs. Sternal markings consisting of dark brown intercoxal lines, a pale median prothoracic blotch, and a small, pale, triangular metathoracic blotch. Legs, fuliginous with narrow dark brown to black markings.

Abdomen, broadly ovate, turbinated; segment 2 with specially prominent, acute, projecting, posterior angles; segments 4–8 with one to two hairs in posterior angles;

whole abdomen, except segment 9, strongly colored; segments 2–7 with broad black lateral bands; segments with long, transverse, dark brown blotches barely separated medially by an uncolored line, widest on second segment and narrowing on each successive segment; transverse blotches confluent medially on segment 1, with a small, medial, angulated, uncolored emargination on anterior margin; segments 2–5 with a series of pustulations along posterior margin of each transverse blotch, and behind each series a narrow dark brown transversal line; segment 1 with but two demi-pustulations near mesal end of each transverse blotch; segment 9 with uncolored anterior angles, and a lateral smoky brown blotch with four or five short pustulated hairs; posterior margin truncate with a few rather short hairs; genitalia extending through segments 3–9.

Female, length 2. mm., width .9 mm.; head, length .65 mm., width .65 mm.; transverse blotches of abdomen, except of segment 1, not closely approached mesally; segments 1–6 with series of pustulated hairs along posterior margin of transverse blotch, four hairs in segment 1, six hairs in segments 2–6; blotches on segments 2–5 acute mesally, blotches of segment 6 diagonally truncate, and of segment 7 flatly rounded; a narrow transversal line between succeeding blotches of each side of abdomen; segment 8 wholly colored, with a narrow transverse line running across segment close to and parallel with anterior margin of blotch; posterior margin convex with four hairs.

Docophorus graviceps n. sp. (Plate iii, fig. 3.)

A single male specimen, taken from an American Coot, *Fulica americana* (Bay of Monterey, California); and two females from a Pacific Loon, *Urinator pacificus* (Bay of Monterey, California).

Description of male. Body, length 2. mm., width .72 mm.; pale golden brown, with characteristic angulated, black, lateral abdominal markings: abdomen Nirmoid, head large and just as broad as long.

Head, length .62 mm., width .61 mm.; broadly conical; clypeus with uncolored, truncated, frontal margin, and rounded angles; a very fine short pair at middle of each rounded anterior angle, and one at the suture; temporal margins with one short prickle and three long hairs; eye with a short hair; trabeculæ broad, acute-angled; antennæ short, thick; signature pale smoky brown, broadly hexagonal; posterior margin slightly rounding; on each side of the signature a similarly colored elongated triangular blotch apex anteriorly; ground color of head pale golden brown with darker mandibles, broad curving antennal bands, narrow temporal margin, and occipital bands convex outwardly; occipital margin straight.

Prothorax, short, broad, a single short hair in posterior angle, and anterior margin deeply emarginated and projecting under the head; broad lateral margins and forward projecting anterior processes dark brown. Metathorax, short, broad, with rounding lateral margins; with a short prickle at rounding anterior angle, a short prickle and long hair in middle of side, and one long and two short hairs at rounding posterior angle; posterior margin slightly convex on abdomen.

Abdomen, long, ovate, with obtuse posterior angles of segments projecting along lateral margin, the angles of segments 1–6 bearing a single hair, 7–8 with two hairs; first segment with brown triangular blotch in anterior angles, segments 2–7 with brown transverse blotches covering almost entire segment; along lateral margins on each segment a sharp blackish angulated line extending forward into preceding segment; inside of this broken marginal line the stigmatal series, and still inside a faint continuous uncolored line; transverse blotch on segment 8 curving, and the lateral line narrow and sinuous; segment 9 but weakly colored; the genitalia extending forward into the eighth segment, and with distinct small claws at posterior end.

The female specimens were so distorted in preparation as to preclude any careful description. The ninth segment is small but distinct, feebly and broadly emarginated, and has two lateral triangular pale brown blotches. The general abdominal markings similar to male, the characteristic angulated black lateral lines being present.

Docophorus acutipectus n. sp. (Plate iii, fig. 4.)

A single female taken on the Rhinoceros Auklet, *Ceratorhina monocerata* (Bay of Monterey, Cal.) This species resembles *D. celedoxus* Nitzsch, taken on *Alca torda*, *Uria troile* and *Fratercula arctica*, but differs in the absence of sternal markings, the almost failing emargination of the clypeus, the character of the genital blotch of the female, and in the larger size.

Description of female. Body, length 1.94 mm., width .7 mm.; golden brown with darker markings, middle space in abdomen whitish.

Head length .56 mm., width .56 mm.; general markings and shape of *celedoxus;* front of clypeus with very faint emargination, one short marginal hair and another just in front of suture; trabeculæ large, obtuse, reaching to middle of second segment of antenna; antennæ with short thick first segment, second segment longest, bearing a short dorsal hair, third and fourth short, equal, fifth longer; temporal margin with two hairs, eye with a short hair, occipital border straight; signature pale smoky brown, long, with posterior acuminate point, darker colored; suture distinct; dark brown antennal bands, continuing in front of suture, behind it angularly curving; occipital bands diverging, and separated from antennal bands by an uncolored line.

Prothorax short with lateral margins obtusely angulated and bearing one hair in angle; broad lateral colored border, anterior border colored, median uncolored space. Metathorax obtusely angled laterally, long and acutely angled on abdomen, three hairs in margin behind lateral angle, broad lateral borders colored. No sternal markings. Legs concolorous with body.

Abdomen elongate ovate; first segment wholly colored except for distinct narrow median uncolored line not reaching quite to posterior border of segment; segments 2–7 with lateral blotches, on segments 2–5 pointed within, on segments 6–7 blunt within; each blotch with stigmatal spot and several wholly or partly enclosed small circular clear spots along posterior margin; segment 8 longer and wholly colored, segment 9 short with two lateral flecks; genital blotch of under side with frontal transverse bar, and extending backward two pointed elongate triangular spaces, lateral ends of the transverse bar diagonally truncate.

Docophorus quadraticeps n. sp. (Plate iii, fig. 5.)

A male and a female taken from an American Coot, *Fulica americana* (Monterey, California). This species closely resembles *kansensis*, taken from an American Eared Grebe, *Colymbus nigricollis californicus* (Lawrence, Kansas). It differs from it by its larger size, the more rotund abdomen, in the distinctly long acuminate signature, and less markedly in the genital blotch.

Description of female. Body, length 1.87 mm., width .87 mm.; short golden brown with narrow dark margins of thorax and anterior half of abdomen, and short triangular abdominal blotches with few large pustulations.

Head, length .6 mm., width .6 mm.; broadly conical, forehead especially broad; front truncate with a hair on dorsal surface in rounded anterior angle, projecting forward behind the hair two very short ones (not marginal, and showing through from underside), and behind them a very long hair; at suture a short marginal hair, and behind the suture two curving hairs on dorsal surface near the margin and projecting beyond the margin; trabeculæ large, broad and colored at base with rapidly tapering uncolored tip; antennæ, weakly colored, first segment thick, second segment slender as long as first segment, third, fourth and fifth short and about equal; temporal angles with three long pustulated hairs, also a marginal hair just behind the eye and a long one in the eye; occipital margin slightly convex in the middle and slightly concave each side of the middle; signature pale, broad, truncate anteriorly and with long, acuminate, darker colored tip projecting beyond the mandibles; antennal bands pale, interrupted by the distinct clypeal sutures, and coalescing with the much darker, conspicuous, widely diverging occipital bands; temporal margins narrowly edged with black.

Prothorax short with rounding angles, posterior margin flatly convex and a single long pustulated hair behind the posterior angles; lateral margins with even black borders bending inwards, narrowing and paling on posterior margin. Metathorax broadly pentagonal, posterior margins thickly set with a line of long pustulated hairs; lateral margins unevenly bordered with dark brown and black, broadest in lateral angles. Legs smoky with darker markings, and uncolored extremities of tibiæ, tarsi and claws.

Abdomen ovate, with several long marginal hairs in posterior angles of segments: segments 1–7 each with a lateral, brown, triangular blotch, with an outer, marginal, narrow, blackish line contiguous to the anterior margin of the segments, but leaving an uncolored space about one-third the length of the segment between the hind margin of blotch and posterior margin of segment; each segment with a single transverse series of long hairs pustulated along the posterior margin of the triangular markings, but not pustulated in the median, uncolored portion of the segment; a conspicuous, clear, stigmatal spot in each blotch; triangle of first segment extending furthest inwards (nearly to median line), and shorter on each succeeding segment; eighth segment wholly colored; ninth segment uncolored, short and emarginated; a large, broadly crescentic, genital blotch with a median, angulated projection in posterior concave border on ventral face of segments 6–7.

Male, length 1.5 mm., width .4 mm.; head, length .53 mm., width .5 mm.; abdomen short, broadly ovate, with triangular blotches prolonged inwardly; ninth segment flatly rounded behind with a few rather long hairs.

Docophorus montereyi n. sp. (Plate iii, fig. 6.)

Abundant on the Ancient, Marbled and Aleutian Murrelets, *Synthliborhampus antiquus*, *Brachyrhampus marmoratus* and *Ptychorhampus aleuticus* (Bay of Monterey, California). Specimens were taken from forty-six individuals out of fifty-five birds of these species shot.

Description of male. Body, length 1.56 mm., width .53 mm.; head large, pale golden brown, abdomen dark, thorax and abdomen with black lateral border.

Head, length .47 mm., width .43 mm.; uncolored front of clypeus very slightly expanded, rounded with a single marginal hair on the side in front of the suture; trabeculæ large reaching almost to the middle of the second antennal segment; antennæ with first segment thick and about as long as second, third and fourth very short, equal, fifth longer than third or fourth; eye with short curving hair; temporal margins with two hairs; occipital margin straight, even slightly convex noticeable at least medially; color pale smoky brown; signature shield shaped with produced acuminate posterior angle not reaching the mandibles, darker colored; antennal bands dark brown, distinct, posterior ends turning diagonally inwards, anterior ends where interrupted by the suture turning in toward the base of the point of the signature, and tapering to an acuminate point; occipital bands dark brown, narrow, uniform, widely diverging, and separated from the antennal bands by a pale diagonal space; region immediately contiguous to the eye dark brown.

Prothorax short, broad, sides diverging, a single long hair in posterior angles; hexagonal, the middle third of the posterior margin making a very obtuse but distinct angle with the lateral thirds; a broad, uniform, dark brown to black border on the lateral margins and lateral thirds of the anterior and posterior margins. Metathorax with sides rapidly diverging; posterior margin with rounding angle on the abdomen, and a series of about fourteen pustulated hairs ranged along its entire length from lateral angle of one side to lateral angle of the other side; lateral margins bordered with dark brown to black; an anterior medial region almost uncolored; rest of segment fuscous. Legs concolorous with head and prothorax, with darker markings.

Abdomen short, suborbicular, turbinated, hinder segments with one to three longish hairs in posterior angles; segment I wholly colored, fuscous, with the blotch angulated medially on posterior margin and emarginated narrowly on anterior margin; remaining segments except the last with a long, lateral, transverse, fuscous blotch preceded by an equally long, transverse, fuscous line, these blotches and lines black along lateral margin of body forming broad, black, lateral, abdominal bands; the blotches and lines separated medially by a pale, almost uncolored space on segments 2–5; on segments 6–7 and on posterior half of segment 5 the blotches and lines coalesce on the median line; several pustulated hairs ranged along posterior margins of blotches on segments 2–6; last segment flatly rounded posteriorly with several longish hairs, a curving, transverse, medial blotch, and regions of the anterior angles uncolored.

Female, with transverse blotches of segments 2–7 of abdomen very short, beginning with anterior segments successively acute, diagonally truncate, and truncate on inner ends, the usually three pustulated hairs conspicuous; large medial space of abdomen whitish; last segment fuscous, with five longish hairs in two groups, one of two and one of three, on each side; measurements, length 1.75 mm., width .7 mm.; head, length .53 mm., width .51 mm.

Docophorus occidentalis n. sp. (Plate iii, fig. 7.)

An abundant species on the Pacific Coast varieties of the Fulmar, *Fulmarus glacialis pacificus* and *F. g. rodgersii;* found on twenty-nine of thirty of these Fulmars shot on the Bay of Monterey, California. Two specimens, probably stragglers, taken on two Surf Scoters, *Oidemia perspicillata* (Bay of Monterey).

Description of the male. Body, length 1.56 mm., width .7 mm.; short, broad, strongly-colored, with black abdominal bands and triangular, lateral, abdominal blotches.

Head, length .53 mm., width .53 mm.; conical, with truncate or weakly convex front; three very small marginal hairs, one of which is slightly in front of suture; trabeculæ reaching slightly beyond base of the second antennal segment; antennæ colored except at sutures, second segment longest, third, fourth and fifth segments about equal; temporal angles with two hairs; eyes with a short spine; occipital margin straight or slightly convex; signature broadly shield-shaped, constricted near the front, anterior margin truncate or slightly emarginated, posterior margin with a darker colored obtuse angle; angulated antennal bands dark colored and specially distinct; occipital bands distinct, widely diverging, and interrupted by a diagonally transverse uncolored line; temples dark brown, narrowly margined with black; occipital margin between bases of occipital bands with border of same width and color as occipital bands, paler in the middle.

Prothorax short, broad with slightly diverging sides and rounded posterior angles, with one hair; with marginal lateral bands bending inwards along posterior margin. Metathorax pentagonal, angled on abdomen, with a series of seven pustulated hairs ranged along latero-posterior margins beginning at lateral angles; last hair of each series removed from others and near the posterior angle; segment mostly brown, with a dark lateral blotch in each lateral angle extending indistinctly along latero-anterior sides. Legs light brown, with dark brown markings. Sternal markings consisting of a short, broad, transverse line in front of the mesocoxæ, terminating inwardly in an expanded circular spot; a distinct, narrow, transverse, intercoxal line between meso- and metacoxæ, bending backward and margining narrowly the coxal cavity, and four small median spots, the hindmost of which is the largest.

Abdomen short, broadly ovate, segments 1–7 with elongate, narrow, brown triangles, with acute apex inwardly; each one of segments 2–6 with three pustulated hairs, one near the lateral margin of the triangle and two near the apex, all along the posterior margin of the triangle; segment 1 with one pustulated hair near the middle, and segment 7 without hairs; segment 8 with narrow curving, transversal, nearly continuous brown band, and segment 9 wholly colored but paler; outer margin of each triangle broadly black, producing black lateral abdominal bands; posterior margin of segment 9 flatly rounded, with about ten longish hairs; segments 3–7 with one to three longish hairs in posterior angles; genitalia extending forward to third segment, and posterior pincer-like portion very strong.

Female. Body, length 1.8 mm., width .78 mm.; head, length .53 mm., width .53 mm.; pustulated hairs of metathorax at subequal distances apart; triangular blotches of abdomen not projecting so far inwardly, and with but two pustulated hairs; segment 8 wholly colored; segment 9 very small, uncolored, with two small lateral blotches, posterior end truncate, and with one short spine at each posterior angle; genital blotch on ventral face of segments 6–7, transverse anteriorly, with two posteriorly projecting pointed processes.

Docophorus kansensis n. sp. (Plate iii, fig. 8.)

A single female specimen taken from an American Eared Grebe, *Colymbus nigricollis californicus* (Lawrence, Kansas). The new form somewhat resembles *colymbinus* (Piaget, Les Pediculines, 1880, p. 117, pl. x, fig. 5, from *Colymbus septentrionalis*), especially in the shape and markings of the head; but the well-defined and characteristic abdominal markings are very different from the abdominal markings of *colymbinus*.

Description of female. Body, length 1.6 mm., width .64 mm.; pale golden brown, with darker, narrow, thoracic borders and short, lateral, triangular, abdominal blotches bearing a few, long, pustulated hairs.

Head, length .47 mm., width .44 mm.; broadly conical, front broad, slightly convex with a shallow median emargination; a hair arising from the dorsal surface near the obtuse anterior angle projects forward beyond the margin; behind this two short hairs (not marginal and showing through as in n. sp. a) and behind these a rather long hair; two short marginal hairs; trabeculæ long and rather slender, acutely-tipped; antennæ long; temporal angles with three hairs, also one hair just behind the eye, and one in anterior angle of eye; occipital border slightly convex; forehead much paler colored than hind head; signature short with slightly concave anterior margin and obtusely angled hinder margin; antennal and internal bands pale, temples and widely separated occipital bands darker.

Prothorax subquadrangular; rounded posterior angles with one hair; posterior border straight; distinct, regular, colored lateral borders. Metathorax pentagonal; with two non-pustulated hairs in lateral angle and five pustulated hairs ranged along each latero-posterior margin; uniform lateral colored border. Legs pale colored except tarsi and claws.

Abdomen, elongate ovate, without angulated lateral projections, with a few pustulated hairs on surface, and one or two rather longish hairs in posterior angles; segments 1–7 with lateral trangular blotch bearing three or four pustulated longish hairs ranged along posterior border of blotch; an uncolored stigmatal spot in each blotch; the lateral margins of segments 1 and 2 (less distinctly in 2) bordered with dark brown like the thoracic segments; segment 8 with transverse blotch extending entirely across the segment; and segment 9 uncolored or faintly colored, with slight emargination and only a few very short hairs.

Docophorus atricolor n. sp. (Plate iii, fig. 9.)

Not uncommon on the Ancient and Marbled Murrelets, *Synthliborhampus antiquus and Brachyrhampus marmoratus* (Bay of Monterey, California). This species is closely related to *colymbinus*.

Description of male. Body, length 1.75 mm., width .71 mm.; rather elongate, Nirmoid in shape, darkly colored all over with wide, black, lateral, abdominal bands.

Head, length .53 mm., width .6 mm.; slightly broader than long, front broad, with shallow rounding emargination, uncolored portion of clypeus slightly expanded, anterior angles rounding; one very short fine marginal hair at indistinct suture; trabeculæ small; antennæ short and slender; temporal margins with two long hairs; eyes flat with a spine; occipital margin concave; clypeal signature broad anteriorly, with truncate front margin, tapering slowly posteriorly to truncate, posterior margin reaching the mandibles; antennal bands darkly brown, right-angled, with posterior ends extending transversely inwards to mandibles; occipital bands distinct, slightly diverging and separated from forehead by a transverse, weakly colored, linear space behind antennal bands; temporal regions brown with margins darker.

Prothorax, small with anterior margin emarginated and projecting under the head; lateral and anterior margins distinctly and evenly bordered with dark brown to black, rest of segment brown; a short spine on lateral margin, and at rounded posterior angle a single hair. Metathorax short, broad, posterior margin flatly convex, angles rounded; a long hair and short spine in an uncolored space in front of middle of lateral margin, and three long hairs in posterior angle; segment wholly colored with darker, small, lateral, marginal blotch, in which is located the clear space containing hair and spine. Legs brown with darker markings.

Abdomen elongate, elliptical, segments short of about equal length; each segment with two weak median hairs on dorsal surface; whole colored dark smoky brown except tip of ninth segment; broad black lateral bands, connected on each segment by a narrow transverse black bar across middle of segment; on first segment this bar broader, covering nearly whole surface of segment, and with a narrow uncolored median line; ninth segment truncate behind with flatly rounded posterior angles; a series of short pustulated hairs along posterior margin; genitalia in segments 8 and 9, side pieces with a distinct toothed posterior claw.

Female, same size; not so dark; ninth segment emarginated for one-half its length, the points being obtusely angled, and with one very short hair each.

Docophorus insolitus n. sp. (Plate iv, fig. 5.)

A few specimens, male and female, taken from an Aleutian Murrelet, *Ptychorhampus aleuticus* (Bay of Monterey, California). This species was not found on other of the numerous individuals of the same bird species taken at Monterey.

Description of female. Body, length 1.65 mm., width .50 mm.; elongate, narrow, Nirmoid in general appearance, with long trabeculæ and distinct clypeal suture; color of head and thorax yellowish brown, abdomen whitish, with strongly marked dark brown bands of the head, borders of thorax, and blackish abdominal lateral bands, and brown transverse blotches.

Head, length .5 mm., width .4 mm.; large in comparison with total size of body, the head being nearly one-third of the total body length, elongate conical; that part of the head in front of the mandibles specially long; front broad, convex, with the margin finely crenulate; three small lateral marginal hairs on forehead; trabeculæ large, blunt; eye with a short hair; temporal angles rounded, with two rather short curving hairs; occipital margin straight; bands of the head, viz., broad antennal, diverging occipital, distinct ocular reaching the tips of the occipital, and narrowly marginal, dark brown and well marked; pale brown signature large, with dark brown posterior angle not reaching mandibles and rather blunt.

Prothorax short, broad, with rounded angles and convex posterior margin; one hair in posterior angles; distinct dark brown lateral and anterior borders, also extending inwards from the posterior angles along the posterior margin, but not meeting; median space almost uncolored. Metathorax pentagonal, with rounding lateral angles and six hairs on each latero-posterior margin; broad lateral dark brown border, broadest in lateral angles. Legs concolorous, with pale brown tinge of body, tarsal claws darker.

Abdomen elongate, narrow, posterior angles of segment 2 produced, acuminate; lateral margins with two longish hairs, a few longish hairs on dorsal aspect; lateral bands semitranslucent smoky brown, composed of a series of slightly diagonal, narrow, marginal blotches, one on each segment, each blotch widest anteriorly, tapering posteriorly and not quite reaching the posterior angle of the segment; segments 1–7 with lateral transverse blotches, those on segment 1 meeting on the median line; large median region of abdomen whitish; segment 8 wholly colored; segment 9 small, uncolored, with very slight angular emargination; genital blotch a narrow, curving, transverse band across segment 6.

Male. Smaller, length 1.34 mm., width .38 mm.; head, length .47 mm., width .37 mm.; metathorax almost wholly fuscous; the lateral transverse blotches of abdomen longer, those on segments 6–7 almost, if not quite, meeting on median line; last segment broadly rounded with several hairs; genitalia pincer-like.

Docophorus icterodes Nitzsch. (Plate iv, fig. 1.)
Germar's Mag. Entomol., 1818, vol. iii, p. 290.

Pediculus dentatus Scopoli, Entomol. Carniol., 1763, p. 383.

Docophorus icterodes Nitzsch, Burmeister, Handbuch d. Entomologie, 1832, vol. ii, p. 424; Gurlt. Mag. f. ges. Thierheilk., 1842, vol. viii, p. 415; Denny, Monograph. Anoplur. Brit., 1842, p. 101, pl. v, fig. 11; Grube, v. Middendorff's sibir. Reise., 1851, vol. ii, part 1, p. 468; Giebel, Insecta Epizoa, 1874, p. 115, pl. x, fig. 8; Piaget, Les Pediculines, 1880, p. 114, pl. x, fig. 1.

Specimens of this common parasite of ducks taken on the Surf Scoter, *Oidemia perspicillata*, the Ruddy Duck, *Erismatura rubida*, the Red-breasted Merganser, *Merganser serrator* (Bay of Monterey, California); and from the Mallard, *Anas boscas*, the Greenwinged Teal, *Anas carolinensis*, the Redhead, *Aythya americana*, the Lesser Scaup, *Aythya affinis*, and the Pintail, *Dafila acuta* (Lawrence, Kansas). Piaget, Giebel and Denny list fully a dozen species of ducks on which *icterodes* has been found.

Giebel has described (Insecta Epizoa) three other species of *Docophorus* (*adustus*, p. 113, *brevimaculatus*, p. 114, and *brunneiceps*, p. 114) found on ducks, and Rudow one species (*natatorum*, Zeitsch. f. ges. Naturwiss, 1870, vol. xxxv, p. 453), all of which Piaget holds to be synonyms of *icterodes*. Piaget doubts also the validity of two or three other of Giebel's species of duck-infesting *Docophori*. The wide geographical and zoological distribution of the species render variations inevitable, and its abundance on such common birds as ducks renders inevitable the observation of these variations.

The measurements of the male specimen figured are: body, length 1.4 mm., width .52 mm.; head, length .44 mm., width .4 mm. The species is easily recognizable by its conspicuous rounding, uncolored clypeus with colored signature, and on each side of it the triangularly-headed anterior projection of the antennal band.

Docophorus pertusus Nitzsch. (Plate iv, figs. 2 and 3.)
Germar's Mag. Entomol., 1818, vol. iii, p. 290.

Docophorus pertusus Nitzsch, Burmeister, Handbuch d. Entomologie, 1832, vol. ii, p. 426; Giebel, Insecta Epizoa, 1874, p. 108, pl. xi, figs. 3, 12; Piaget, Les Pediculines, 1880, p. 89.

Males, females, and young from eight out of eleven specimens of American Coot, *Fulica americana* (Monterey, California), and from one out of three specimens of same bird species taken at Lawrence, Kansas. A single specimen was taken from a Ruddy Duck, *Erismatura rubida* (Monterey, California). The Ruddy Ducks and Coots are such constant associates that it is not surprising to find this Coot parasite occasionally on this species of duck. Also a single male was taken from an American Eared Grebe, *Colymbus nigricollis californicus* (Bay of Monterey, California). The characteristic forcipated appearance of the clypeus easily distinguishes the species; in some specimens the "pincers" will be found closed, so that the deep frontal emargination is quite enclosed, while in others the "pincers" will be open. My specimens do not agree with Giebel's figures and Piaget's description as to length of signature; in my specimens the acuminate posterior point extends quite to the mandibles. I figure a female, and an immature specimen. The young stage is interesting, as it shows no evidence of the pincer-like condition of the clypeus, and the clypeal signature is arrested far in front of the mandibles. The measurements of the specimens figured are: Female, body, length 2. mm., width .92 mm.; head, length .6 mm., width .6 mm. Immature, body, length 1.7 mm., width .84 mm.; head, length .52 mm., width .5 mm. Nitzsch's specimens were found on *Fulica atra*.

Docophorus lari Denny. (Plate iv, fig. 4.)

Monograph Anoplurorum Britanniæ, 1842, p. 89, pl. v, fig. 9.

Pediculus lari Fabricius, Fauna Groenlandica, 1780, p. 218.

Philopterus lari Fabr., Walckenær, Hist. Nat. Ins. Apt., 1844, vol. iii, p. 337.

Docophorus gonothorax Giebel, Zeitschr. f. ges. Naturwiss., 1871, vol. xxxvii, p. 450; Giebel, Insecta Epizoa, 1874, p. 111.

Docophorus congener Giebel, Insecta Epizoa, 1874, p. 111.

Docophorus lari Denny, Piaget, Les Pediculines, 1880, p. 111, pl. ix, fig. 7.

Many specimens of this common parasite of the gulls on *Larus argentatus smithsonianus*, *canus*, *occidentalis*, *brachyrhynchus*, *glaucescens*, *heermanni*, *vegæ*, *delewarensis*, *glaucus* and *Rissa tridactyla pollicaris* (Bay of Monterey, Cal.), and from *Larus delewarensis* (Lawrence, Kansas). In all, I have examined eighty-seven specimens of gulls of the various species mentioned, and have collected this parasite on seventy-eight of them. Piaget and others have found this parasite on *Larus canus*, *marinus*, *fuscus*, *glaucus*, *argentatus*, *ridibundus*, *atricilla*, *islandicus*, *leucophæus*, *cyanorhynchus*, *Pagophila eburnea*, *Rissa tridactyla*, *Sulla bassana*, and *Lestris parasiticus*. I have found males, females and young of this parasite on *Colymbus nigricollis californicus* and *Urinator lumme;* these can hardly be stragglers.

Piaget has named and briefly described three varieties of this species, there being apparent a considerable variation in size, in shape of the clypeus and character of the male genitalia. The careful examination of a large number of specimens from different species of gulls is necessary for an understanding of the condition of the species. I hope to have opportunity to make such a study soon.

The species is easily recognized by the strong markings, broad truncate clypeus and large acuminate signature. The female specimen figured measured as follows: body, length 2. mm., width .93 mm.; head, length .62 mm., width .63 mm.

Despite the smaller size I do not understand, from the description, how Picaglia's *D. larinus* (Atti d. Soc. Ital. d. Sci. Nat., 1885, vol. xxviii) differs specifically from *lari*.

Docophorus melanocephalus Burmeister. (Plate iv, fig. 6.)

Burmeister, Handbook d. Entomologie, 1832, vol. ii, p. 426.

Docophorus laricola Nitzsch. (*in pars*) Zeitschr. f. ges. Naturwiss. (ed. Giebel) 1866, vol. xxviii, p. 363.

Docophorus caspicus Nitzsch. Zeitschr. f. ges. Naturwiss. (ed. Giebel) 1866, vol. xxviii, p. 361, fig. 87.

Docophorus melanocephalus Burm. Giebel, Insecta Epizoa, 1874, p. 110, Pl. xi, fig. 8; Piaget, Les Pediculines, p. 109, pl. ix, fig. 5.

Many specimens taken from the Royal Tern, *Sterna maxima*.

This is the most abundant parasite of this Tern (Bay of Monterey, California). I found it on every one of fourteen specimens shot. The European authors record its occurrence on *Sterna caspia*, *cantiaca*, and on *Larus ridibunda* and *cirrocephalus* (localities?). Giebel describes also as a distinct species *lobaticeps* (Insecta Epizoa, p. 109), a closely related, if not identical, form taken on *Sterna hirundo* and *Sterna fissipes*. Piaget believes *lobaticeps* to be identical with *melanocephalus*.

The distinguishing characters of *melanocephalus* are its general dark color, its especially dark colored head, prominent signature with long acuminate point reaching the mandibles, slightly convex clypeal front, and the presence of a small spine and a short hair in the eye. The measurements of the female specimen figured are: Length 2.1 mm., width .9 mm.; head, length .65 mm., width .65 mm.

Nirmus præstans n. sp. (Plate v, figs. 1 and 2.)

Taken on the Royal Tern, *Sterna maxima* (Bay of Monterey, California). But two specimens, both males, of this new *Nirmus* were taken, one from each of two birds. The new form belongs to the group *nigropicti*.

Body, length 3.25 mm., width .5; with marginal markings of black, and abdominal blotches of chestnut brown.

Head, length .56 mm., width .5 mm.; broadly conical, widest at posterior angles, with temporal margins and margins of forehead in nearly straight diagonal lines; clypeus truncate in front (even slightly concave), with three lateral short hairs; signature with broad anterior margin colored (brown); a rather broad lateral black line interrupted posteriorly by the suture, but reappearing behind the suture as a black blotch; antennal bands black, outer ends curving forward; trabeculæ distinct, as long as first antennal segment; antennæ with second segment longest, fifth longer than third or fourth which are equal, uncolored, except the fifth segment, which is light brown with distinct short hairs on tip; eyes with a bristle; temporal margins narrowly bordered with black and with one long hair; occipital angles rounded, posterior border doubly emarginated; occipital signature black and labium brown, visible on under side; mandibular rami strongly colored.

Prothorax quadrangular, much narrower than head; angles obtuse to rounding; lateral margins strongly and broadly colored, the colored band running inward along the posterior margin for about one-third the length of the margin and slightly expanded at inner end. Metathorax, transverse, five sided, lateral margins with a feeble concavity, posterior angles rounding with five separated, strong, pustulated hairs arranged, irregularly spaced, the three outermost close together, in a row extending inwards along the posterior margin; posterior margin obtusely angled on the abdomen; lateral margins with a strong, dark brown, linear blotch expanding at the ends; sternal markings consisting of broad intercoxal lines, and a triangular median blotch on metathorax. Legs mostly uncolored, with femur semiannulated with dark brown at basal and distal extremities; tibiæ annulated at distal end; tarsus light brown; claws uncolored.

Abdomen, elongate ovate; posterior angles of segments with few hairs; surface glabrous, first segment without transparent lateral margin, with circular black spot in anterior angle; segments 2–6 with transparent lateral margin, narrower posteriorly; in each anterior angle a black, linear, obliquely directed blotch produced anteriorly across the suture and into the preceding segment; on segment 7 this blotch very faint or obsolete; at the posterior angle a small distinct blotch; on the eighth segment a small marginal blotch, and on the ninth a transversal, curving, brown line; on the dorsal surface a small, short, curving, median, transversal brown line on the second segment, and a similar slightly larger one on the third segment; on segments 3–6 the broad transversal blotches of the ventral surface show through, as also do the chitinized parts of the genitalia; on the ventral surface there are median transversal brown markings as follows: on the first segment a small wide triangle, on the second segment a semiellipse with convex side forward, on segments 3–6 broad transverse blotches largest on segments 4–5; genitalia showing distinctly; one or two hairs at posterior angles of segments 1–7; segment 8 with a strong, long, hair and a shorter one on lateral margin; segment 9 with strong hairs arising from dorsal and ventral surfaces of the rounded posterior margin, in all about ten.

Nirmus hebes n. sp. (Plate v, fig. 3.)

A single poorly-preserved specimen from a Royal Tern, *Sterna maxima* (Bay of Monterey, California).

Description. Body, length 1.72 mm., width .5 mm.; strongly marked, abdomen with large, lateral, transverse blotches and an uncolored longitudinal median line.

Head, length .47 mm., width .35 mm.; elongate conical, front truncate, bare (?); trabeculæ small but distinct; temporal margins subparallel, with one hair near posterior angle; antennal bands distinct, dark brown, bending inwards at the suture, and with posterior extremity expanded; temporal margins narrowly edged with dark brown; occipital bands indistinct, diverging, more strongly colored at base.

Prothorax with rounded angles, bare (?); posterior margin flatly convex, with colored lateral border. Metathorax with rounded anterior angles, diverging sides and obtuse posterior angles; angulated on abdomen; two or more hairs in posterior angles; lateral borders colored. Legs concolorous with body, with darker narrow margins. Sternal markings consisting of two pairs of intercoxal lines.

Abdomen elongate elliptical; posterior angles of posterior segments with short hairs; each of segments 2–7 with a marginal black blotch, widest anteriorly and projecting inward along the anterior margin of segment, but paling to brown; this projection stops at a median, longitudinal, uncolored line, turns posteriorly to the posterior margin of the segment and runs along the segment outwardly for a short distance; that part of the lateral portion of the segment not colored by this black and dark brown curving blotch is golden brown: segment 8 wholly colored with narrow, black, lateral margin; segment 9 uncolored, with two small, brown blotches; posterior margin feebly emarginate.

Nirmus farallonii n. sp. (Plate v, fig. 4.)

A single female specimen taken from a Farallone Cormorant *Phalacrocorax dilophus albociliatus* (Bay of Monterey, Cal.) An immature specimen taken from a Western Grebe, *Colymbus septentrionalis* (Bay of Monterey, Cal.) is also probably of this species. It may be a straggler. In general marking and outline this new species resembles *Nirmus dispar* Piaget, taken by the namer on a *Carbo sulcirostris* from a skin in the Leyden Museum. *Dispar* is a much smaller species, and lacks the characteristic median abdominal blotches of *farallonii*.

Female. Body, length 2.66 mm., width .84; ground color pale clear brown; strongly and extensively marked with dark brown.

Head, length .6 mm., width .53 mm.; conical, narrow in front and rounding; five marginal hairs, a long one on dorsal surface between the front two and two shorter ones on dorsal surface near the fourth marginal; trabeculæ small and nearly obtuse; temporal margins rounding and with one long hair and several short prickles; occipital margin slightly concave; eyes prominent, with a very short prickle; antennæ short, second segment longest, third and fourth about equal, fifth longer, concolorous with pale ground color of head; clypeal signature distinct, short pentagonal, with hinder margins and posterior angle rounded; whole head, except small parts of clypeus, pale brown; antennal bands broad, distinct, bending in at suture; small black ocular flecks, and converging occipital bands.

Prothorax shorter than broad, quadrangular with rounding angles; one long hair and one short thorny hair at posterior angle; color brown, with darker lateral bands which expand into triangular dark brown blotches in posterior angles. Metathorax broader than long, quadrangular with lateral margins diverging slightly, and anterior angles distinctly expanding and tubercular in front of a constriction; posterior margin straight; posterior angles with one long and one short hair in point of angle, and near them five long hairs set in an elliptical clear space; brown, palest in center, lateral bands very dark in posterior two-thirds, and bending in along anterior margin. Legs colored.

Abdomen elongate elliptical, with posterior angles projecting, and two or three rather long hairs in each angle; a few long hairs on dorsal surface; segment 1 all brown, others with strong, quadrangular, lateral, brown blotches, black on outer margin, and with uncolored stigmatal spots and a median quadrangular light brown blotch; posterior angles uncolored; segments 8–9 undivided, but with distinct blotches and no median blotches; segment 9 rounding, hardly if at all emarginated, and with only a few short hairs.

Nirmus orarius n. sp. (Plate v, fig. 5.)

A single specimen from a Golden Plover, *Charadrius dominicus* (Lawrence, Kansas). This form is a member of the group *obscuro-suturati*, and resembles somewhat my species *bœphilus* from a Killdeer Plover, *Ægialitis vociferus;* the body, however, is shorter and not parallel-sided, though the form is still a slender, graceful one.

Female. Body, length 1.84 mm., width .4 mm.; pale with narrow distinct marginal markings.

Head, length .5 mm., width .28 mm.; head elongate conical, with expanded uncolored part of clypeus in front not angulated as in *bœphilus*, but rounding; three clypeal hairs and one on dorsal surface in front of the trabecula projecting over the margin; trabeculæ small, clear, but distinct; temporal margins weakly convex with two long hairs; occipital margin faintly concave; eyes flat with a long hair: antennæ uncolored, short: clypeal signature uncolored: mandibles and labium brown, a narrow lateral brown margin along forehead interrupted in front of antennæ and at suture and along temples.

Prothorax markedly narrower than head; quadrangular, with sides converging slightly toward front: one hair in posterior angle: with brown marginal band distinct along posterior margin. Metathorax but little longer than prothorax, wider, with rapidly diverging lateral margins; posterior margin angulated: four long hairs in posterior angles, grouped in pairs, one pair being a short distance inward on posterior margin; an interrupted, lateral, brown band and a long, triangular, brown blotch projecting inwards from middle of lateral margin. Legs uncolored with weakly colored tarsi.

Abdomen elongate, with convex sides, not parallel; segments of about equal length; segment 9 short and with weak, rounding emargination on posterior margin; a few scattered weak hairs on surface, and segments 5–8 with one or two weak hairs in posterior angles; a narrow, lateral band emphatic in anterior part of each segment and margined outwardly by a narrow clear space; segments 1–6 with large, median, pale brown transverse blotch.

Nirmus giganticola n. sp. (Plate v, fig. 6.)

This well-marked *Nirmus* of the group *nigropicti* was taken from the Short-tailed Albatross, *Diomedea albatrus* (Bay of Monterey, California). It was found on both of two birds of this species shot. I have not found it on any other bird-species.

Body, length 3.5 mm., width .87 mm.; white with a few definitely arranged black and brown spots; of about the average size and usual shape of the *Nirmi nigropicti;*

body with a few hairs on margins, general surface glabrous.

Description of male. Head, length .75 mm., width .62 mm.; conical, front produced and narrowly rounded, almost angulated; sides of forehead with five hairs, and one short one between the first two which rises on upper surface of clypeus at some distance from the margin; between second and third marginal hairs a short hair rising from surface of head so far inward that its tip does not project over the margin; temporal margins rounding, with few short hairs; occipital margin slightly and broadly concave; trabeculæ wanting; eyes distinct; antennæ with first and second joints longest, each as long as third and fourth, fifth longer than fourth, uncolored; clypeus uncolored; margins of forehead with a short, interrupted, dark brown line; an irregularly shaped dark brown orbital blotch; a small occipital signature; mandibles chestnut brown.

Prothorax rectangular, angles obtuse, glabrous, uncolored, with broad transparent margin. Metathorax trapezoidal, widest at posterior angles; lateral margins slightly concave, deepest before the middle; posterior margin weakly concave; a slender hair at each posterior angle, and in the angular area four long, strong hairs set closely together in a circular, uncolored spot; by each lateral margin just before the middle a conspicuous black triangle with apex directed inwards, situated in a marginal transparent space; no sternal markings. Legs uncolored except distal extremity of tibia and tarsus, which are dark brown; with a few scattered hairs.

Abdomen, third, fourth and fifth segments broadest and of about equal width, eighth much narrower than seventh, ninth very narrow and small; posterior angle of second segment with two hairs; posterior angles of segments 3–6 with three hairs, of seventh with at least four hairs, eighth segment with two hairs at each anterior and posterior angle; ninth segment feebly angularly emarginated with one short stiff hair on each side of the emargination; lateral margins of abdomen transparent, containing entering whitish appendages of clear chitin, and on segments 2–7 a small distinct black blotch near the anterior angle of each segment; seventh segment also with a slightly curving, elongate, black fleck in the posterior angle; eighth segment marked like the seventh except that the posterior blotch is more narrowly linear; segment 9 with a narrow marginal blotch on each side.

Female generally similar to male; abdomen with one hair on posterior angle of first segment, two hairs on segments 2–4, three hairs on segments 5–7; segment 9 more acute than in male and two-pointed; segment 8 with linear blotch extending along whole length of margin; inside of lower end of this blotch and of marginal blotch of ninth segment a curving, linear, brown blotch; opening of vulva with nine stiff hairs on each margin.

This member of the *Nirmi nigropicti* differs markedly by the produced and narrowly rounded clypeus, the long metathorax with acuminate posterior margin, and the entire absence in both sexes of transverse blotches or lines on the abdomen from such forms as *punctatus*, *selliger*, and *lineolatus*, which in general appearance are somewhat similar to this new form.

Nirmus bœphilus n. sp. (Plate v, fig. 7.)

A single female taken from a Killdeer Plover, *Ægialitis vocifera* (Lawrence, Kansas). Packard's outline figure and incomplete description of *Lipeurus gracilis*, host? (Amer. Nat., 1870, vol. iv, p. 95, pl. i, fig. 6) must refer to a form resembling, in shape and markings, at least, this species. The new species belongs to the group *obscuro-suturati*.

Description of female. Body, length 1.95 mm., width .34 mm.; very elongate and slender, parallel-sided, pale with distinct brown marginal bands on head, thorax and abdomen, and with weakly colored and ill-defined transverse abdominal markings.

Head, length .48 mm., width .23 mm.; elongate, conical, with clypeus expanded, and obtusely angled in front and at sides; the expanded part of the clypeus is uncolored; one lateral hair on expanded clypeal portion, two in front of the suture (one rising from dorsal surface and one from ventral), one at the suture, and two rising from the ventral surface and projecting beyond the lateral margin behind the suture, and one long hair rising from the internal band and projecting beyond the lateral margin of the forehead; trabeculæ small but distinct, acute; temporal margins subparallel, with one long hair and one shorter hair; occipital margin concave; eyes inconspicuous; antennæ with second segment longest, fifth next, third next, fourth next, segment 1 short and thick, uncolored, except a faint brownish tinge on segment 5; clypeal signature triangular with apex toward the mandibles; entire lateral margin of head narrowly dark brown, interrupted at clypeal suture and emphasized at beginning of antennal band; uncolored occipital bands converging toward the mandibles, and uncolored internal bands bending outward at suture to meet antennal bands and in front of mandibles to enclose oral fossa.

Prothorax truncated, conical, sides converging in front, with well defined brown marginal bands around the entire segments, and a single hair at posterior angle. Metathorax but little longer than prothorax, wider, also truncated conical with lateral brown bands interrupted at middle, and three long hairs in posterier angle, and one pustulated hair on each latero-posterior margin; a median, long, spear-head shaped sternal blotch of pale brown showing through. Legs with colored tarsi and strong claws.

Abdomen very long, slender, parallel sided, with few scattered long hairs on surface and in posterior angles of segments; segments 8–9 tapering posteriorly; segment 9 slightly but angularly emarginated, without terminal hairs on points; all segments with distinct narrow lateral brown bands, slightly expanding at front of each segment and projecting across the sutures; segment 1 with truncated, conical, paler, median blotch; other segments with indistinct, large, quadrangular, median blotches.

Nirmus punctatus Nitzsch. (Plate vi, figs 1 and 2.)
Germar's Mag. Entomol., 1818, vol. iii, p. 291.

Philopterus grammicus Gervais, Hist. Nat. Apteres, 1847, vol. iii, p. 350.

Nirmus punctatus Nitzsch. Nitzsch. (ed. Giebel) Zeitschr. f. ges Naturwiss., 1866, vol. xxviii, p. 377; Giebel, Insecta Epizoa, 1874, p. 176, pl. iv, figs. 1, 2; Piaget, Les Pediculines, 1880, p. 200, pl. xvi, fig. 4.

A female and two immature specimens taken from a Western Herring Gull, *Larus occidentalis* (Bay of Monterey, California). This species was found by Nitzsch on *Larus ridibundus*, and by Piaget on a *Larus dominicanus* from Chili, a *Larus crassirostris* from China, and a *Larus ichthyaëtus* from the Volgas; a well distributed form, surely. Piaget's figure omits the short hairs at the anterior angles of the clypeus present apparently in all *nigropicti*, and his description consistently with the drawing refers to but three hairs on each side of the clypeus, where there are really four. The specimen is much larger (length 2.4 mm.) than Piaget's seem to have been, the average length of his female specimens being 1.9 mm.

Description of young. Length, 1.5 mm., differing from adult specially in incompleteness of markings and relative shortness of body. Head, length 5 mm., width .41 mm.; more rounding than truncate in front and without colored markings, except dark brown labium and pale brown mandibles; ratio of breadth to length greater than in adult. Thorax with a lateral small black blotch near anterior angle of metathorax. Abdomen, length .81 mm., width .41 mm.; without median markings, a small black blotch at anterior angle of segments 1–7, blotches growing smaller in each succeeding segment.

Nirmus felix Giebel. (Plate vi, figs. 3 and 4.)
Insecta Epizoa, 1874, p. 175.

Two specimens, both males, taken from two specimens of Heerman's Gull, *Larus heermani* (Bay of Monterey, California), may be attributed to this species of Giebel established on a single female taken from the same species of gull. Piaget (Les Pediculines, p. 201) assumes to believe Giebel's specimen a variety of *punctatus*. "Cette spèce ne me paraît non plus qu'une variété du *punctatus* où l'occiput n'est pas bordé de noir et les taches de l'abdomen sont plus allongées transversalement." But the differences between the males taken by me and the male *punctatus* are much more considerable than this. The black bordering of the head and the strong tripartite blotches of the abdomen remove it distinctly from any immediate similarity with *punctatus*; in fact, the species more nearly resembles *lineolatus* than *punctatus* (compare figures 1, 3, 4, 7 and 8, plate vi). Its most striking resemblance, however, is to *præstans*, the transparent clypeus, different abdominal markings and markedly different male genitalia distinguishing it from *præstans*.

Description of male. Body, length 3.66 mm., width .62 mm.; white, with dark brown or black marginal markings, and chestnut brown, median abdominal markings.

Head, length .53 mm., width .50 mm.: conical, clypeus truncate, even slightly concave in front, a short hair at each anterior angle and five other short hairs in the lateral margin between it and the small but distinct trabecula; temporal margin slightly rounding, with two longish hairs, and behind the hinder one two very short, stiff, prickle-like hairs; posterior margin straight; antennæ uncolored, second segment longest, third, fourth and fifth segments about equal; anterior part of clypeus transparent, and a transparent space on each side just inside of trabeculæ; margin of forehead with a twice-interrupted, uneven, black line, the middle third of it not contiguous to the margin and thickly crescentic; a black border along the temporal margins, bending inwards at anterior end; labium black; mandibles chestnut brown.

Prothorax quadrangular, bordered laterally with black, which runs inward along the posterior margin one-third the length of the margin; a single hair at posterior angles. Metathorax pentagonal, bordered on the anterior lateral margins with dark brown, inside of which the short, curving, black, intercoxal lines of the sternum show through; posterior lateral angles with five strong pustulated hairs almost exactly as in *præstans;* posterior margin angulated on abdomen; sternal markings consist of an obtusely-pointed, nipple-like fleck, projecting inwards from lateral margin of metathorax. Legs, femur with brown fleck at basal end and tibia with brown blotch at distal end, tarsus brown, otherwise white; tibia with three short, stiff hairs on inner side and one on outer side; femur with two or three short hairs arising in basal blotch.

Abdomen with segment 4 widest; nearly parallel-sided for most of its length; segment 1 with small black blotch at anterior angles, segments 2–7 with triangular (segments 2–3), or curving, angulated (segments 4–7) blotches in anterior angles, with transparent spots at posterior angles and margins narrowly transparent; segment 8 with irregular black marginal blotch; segment 9 with two short chestnut lines parallel with posterior rounding margin; on dorsal surface of segments 2–6 a median transverse chestnut line shortest on second and on sixth segments, and with anterior border of each mark emarginated; ventral surface of segment 5 with broad transverse chestnut blotch almost divided in the middle; segments 4 and 6 with such blotches completely and widely divided, making two lateral blotches on each segment; segment 3 with faint indications of such lateral blotches; genitalia confined to segments 7–8, side pieces angulated with points projecting inwards and slightly crossing each other at tips; posterior angles of abdominal segments with few long hairs; segment 8 with hairs rising from middle of margin; segment 9 with about twelve hairs along posterior margin which is broadly rounded.

Nirmus signatus Piaget. (Plate vi, fig. 5.)

Les Pediculines, 1880, p. 186, pl. xv, fig. 8.

Nirmus signatus Piaget, König, Ein Beitrag zur Mallophagenfauna, 1884, p. 10.

Three males and three females taken from an American Avocet, *Recurvirostra americana* (Lawrence, Kansas). Piaget found this species common on *Recurvirostra avocetta* (Zool. Garden of Rotterdam), and König found it abundant on the same bird species taken near Kiel.

As Piaget figures only the female, and the differences between the sexes in shape and markings of abdomen and character of last segments is considerable, I figure the male. The difference in size between the sexes is considerable, as shown by the following measurements of my specimens: Male, body, length 1.9 mm., width .5 mm.; head, length 5 mm., width .36 mm. Female, body, length 2.5 mm., width .62 mm.; head, length .56 mm., width .4 mm. The characteristic markings of the species, especially the large and sharply-defined signature, make it easily recognized.

Nirmus pileus Nitzsch. (Plate vi, fig. 6.)

Germar's Mag. Entomol., 1818, vol. iii, p. 291.

Nirmus pileus Nitzsch, Zeitschr. f. ges. Naturwiss., 1866, vol. xxviii, p. 373; Giebel, Insecta Epizoa, 1874, p. 162; Piaget, Les Pediculines, 1880, p. 182, pl. xv, fig. 6.

A single specimen, female, taken from an American Avocet, *Recurvirostra americana* (Lawrence, Kansas). Nitzsch's and Piaget's specimens were taken on *Recurvirostra avocetta.* I figure the female, although Piaget's figure is excellent, for the convenience of American students. The measurements of the specimen are: Body, length 2.8 mm., width .78 mm.; head, length .62 mm., width .60 mm. These measurements vary a little from Piaget's, my specimen being shorter and wider, and the head a fifth greater in length and width.

Nirmus lineolatus Nitzsch. (Plate vi, figs. 7, 8 and 9.)

Zeitsch. f. ges. Naturwiss., 1866, vol. xxviii, p. 376 (ed. Giebel).

Nirmus ornatus Grube, v. Middendorff's sibir. Reise zool., vol. i, p. 477, pl. i, fig. 4.

Nirmus lineolatus Nitzsch, Burmeister, Handb. Entomol., 1838, vol. ii, p. 428; Giebel, Insecta Epizoa, 1874, p. 177; Piaget, Les Pediculines, 1880, p. 199.

I have taken this common *Nirmus* of the gulls from *Larus argentatus smithsonianus*, *brachyrhynchus*, *glaucescens*, *canus*, *vegæ*, *occidentalis*, *heermanni*, *californicus*, *delewarensis* (Bay of Monterey, California). Nitzsch found it on *Larus canus*, *argentatus*, *glaucus*, *tridactylus*, and Piaget on *argentatus* and *glaucus*. It is readily distinguishable by its characteristic head markings and by the ventral abdominal blotches and the genitalia of the male. The young, which I have found in many stages of growth, differ from the adult, especially in the shape of the head and the markings of the body.

Description of very young. Body white, with few brown markings. Head short, broadly conical; front rounded; temporal angles with a single long hair; front with two very short hairs on each side (invisible except under high magnification); antennæ rather short and thick, uncolored; mandibles pale brown; a small black ocular fleck; head otherwise uncolored. Thorax shaped as in adult, with but four long metathoracic hairs instead of six; prothorax unmarked; a small fleck at anterior angle of metathorax. Abdomen with sides subparallel; no medial markings; a small lateral marginal blotch on segments 1–7; segments 1–4 without hairs at posterior angles.

Lipeurus densus n. sp. (Plate vii, figs. 1 and 2.)

A single female specimen taken from a Short-tailed Albatross, *Diomedea albatrus* (Bay of Monterey, California). The form is a well-marked member of the group *circumfasciata*. As indicated by the clypeus, the simple lateral bands of the abdomen, and the concave posterior margin of the metathorax, it somewhat resembles *heterogrammicus* taken by Nitzsch and Piaget on *Perdix cinerea*.

Description of female. Body, length 4.3 mm., width .81 mm.; white, strongly marked with dark brown and black; sides subparallel.

Head, length .94 mm., width .75 mm., sides nearly parallel; clypeus obtusely angulated in front; six hairs on each side of forehead, the anterior one longest; trabeculæ wanting; antennæ uncolored, second segment longest, as long as fourth and fifth together, first and third about equal in length, with a very few scattered short hairs; eye prominent, hemispherical; temporal margin with two minute hair prickles, no other hairs; occipital margin concave; a strong, dark brown band completely bordering forehead, and continuing, interrupted at antennary fossæ, along temporal margins almost to occipital angles.

Prothorax quadrangular, convex on metathorax; two separated hairs at occipital angles; a lateral marginal brown blotch bounded outwardly along its posterior half by a transparent edge. Metathorax with lateral margins concave, deepest before the middle; anterior angles obliquely truncate; posterior margin straight or feebly concave; three long, strong, hairs in the posterior angles, arising from an elliptical uncolored space; a large brown blotch in anterior angles, and a smaller one in posterior angles, also a narrow marginal band running full length of segment. Sternal markings consisting of a faint bordering of anterior coxal cavities, an intercoxal line between pro- and mesacoxæ, an obscure median semicircular blotch with convex margin posteriorly, and a rather broad lateral marginal band on metathorax. Fore legs short, coxæ narrowly separated and globular, femora wide, tarsi alone colored; middle and hind legs long, coxæ produced widely and separated; femora long and slender; femora and tibiæ with dorsal, elongate, dark brown markings; tarsi and claws pale brown; tibiæ with two long hairs and three short ones on outer margin.

Abdomen with sides of segments 1–7 parallel; sides of segments 8–10 tapering posteriorly, tenth segment bicuspidate; posterior angles of segments 1–4 without hairs, angles of segments 5–6 with one hair, of segment 7 with three hairs, segment 8 with one hair rising before the angle, segment 9 with two hairs, segment 10 with each posterior point bearing four hairs, two arising on margin and one each from dorsal and ventral surfaces; a strong broad, dark brown, marginal band, this band projecting in on segment 9 almost to median line; segment 10 wholly colored.

Lipeurus varius n. sp. (Plate vii, figs. 3 and 4.)

A common parasite of the Pacific Fulmars, *Fulmarus glacialis* vars. *glupischa* and *rodgersii*, being found by me on twenty-six out of thirty specimens of these Fulmars shot on the Bay of Monterey, California. This white and blotched species belongs to the *Lipeuri circumfasciati*, and shows some similarity of appearance to *tricolor* Piaget (Les Pediculines, p. 363, pl. xxx, fig. 4), taken from an Albatross. Although this parasite was found on nearly all the Fulmars shot, on none was it present in large numbers (as was its companion *Lipeurus celer*), and among all the specimens taken by me, perhaps one hundred in total number, there is not a male.

Description of female. Body, length 2.9 mm., width .62 mm.; white, with distinct dark brown markings, marginal on head and thorax, and as lateral blotches not reaching the margins on abdomen.

Head, length .6 mm., width .4 mm.; sides subparallel, front parabolic, with five marginal hairs on forehead, one of which is separated from the others and close to angle of antennary fossa, and a short hair on dorsal surface projecting beyond the margin between first two marginal hairs: trabeculæ wanting; temporal margins with a single short hair; eyes distinct, with a fine prickle on margin just behind them; occipital margin straight; head uncolored and pale smoky brown, with dark brown circumferential antennal bands and ocular blotches which extend backwards, paling, over temporal region; antennæ uncolored, first two segments about equal, third and fourth equal and shorter, and fifth slightly longer than third or fourth.

Prothorax nearly square, angles rounding, posterior ones slightly swollen; whitish, except even dark brown lateral border. Metathorax elongate, slightly widening posteriorly, anterior angles swollen, posterior margin straight, with four long hairs, not pustulated, in posterior angles; lateral margins unevenly bordered with black and dark brown, widest anteriorly; sternal blotch pale brown, anterior part elliptical, with a backward-projecting, long, slender, tapering process. Legs uncolored except for pale brown tarsi and claws.

Abdomen slightly widening to segment 6, and then more rapidly narrowing; white, with two lateral brown quadrangular blotches, fading inwardly, and each, except on segments 1 and 7–9, with uncolored stigmatal spot; these distinct and characteristic lateral blotches do not touch the lateral margin, the white marginal border varying from very narrow to one-half the width of the blotches, as in the specimen figured; ninth segment angularly emarginated with two hairs on each point.

I figure an immature specimen which is about one-half the size of an adult; it lacks entirely the abdominal markings, showing small portions, but intensely colored, of the thoracic and head markings. The presence of but one of the long metathoracic hairs is interesting, and the usual large head, characteristic of the immature stages, is noticeable.

Lipeuru celer n. sp. (Plate vii, figs. 5 and 6).

This large dark form was found in great numbers on all specimens except one of thirty Pacific Fulmars, *Fulmarus glacialis* vars. *glupischa* and *rodgersii* (Bay of Monterey, California), examined by me. It belongs to Taschenberg's group, *clypeati sutura indistincta*, and its most obvious resemblances are to *grandis* taken by Piaget on *Procellaria pelagica* in the Zoological Garden of Rotterdam. It is distinguished from *grandis* by the different form of the head, by lacking the occipital signature, by the presence of occipital bands, by the markedly different abdominal markings, by the different character of the last segment of the male, and by other less obvious characters. Its dark color and large size make it a conspicuous object on the birds.

Description of female. Length 3.37 mm., width .7 mm.; body everywhere brown, the accentuated markings black, sides of head, thorax and abdomen subparallel.

Head, length 7. mm., width .5 mm.; sides nearly parallel; clypeus narrowly rounded in front with six lateral short hairs of which four are located along the margin at nearly equal distances apart, one arising from the dorsal surface near the anterior marginal hair, and one near the antennæ; trabeculæ wanting; temporal margins weakly convex with one long hair; antennæ with segments 1–2 about equal in length, segment 3 but little shorter, segments 4–5 shorter and feebly colored; whole head chestnut brown; clypeal signature wide anteriorly, short, and acuminate posteriorly; the pronounced antennal bands projecting inward at their basal extremities: the irregular orbital blotches, the narrow temporal marginal bands, and the distinct occipital bands much expanded at occipital margin, black or strongly dark brown.

Prothorax short, quadrangular, slightly wider posteriorly; chestnut brown, paler in the middle; lateral borders black. Metathorax widest at posterior angles; brown; lateral margins broadly and irregularly bordered with black: four long hairs arising from an uncolored spot. Sternum almost completely brown, showing a broad long median blotch abruptly pointed behind, set off by narrow uncolored lines from the broad lateral bands. Legs with coxæ, femora and tibiæ dark brown: femora paler on inner side and at distal extremity; trochanters uncolored; tarsi pale brown.

Abdomen with sides nearly parallel; segment 8 narrower and segment 9 very narrow and short; segment 1 shorter than the nearly equal segments 2–7; all segments brown; segments 1–7 with a rather broad, black, lateral, marginal blotch, emarginated on inner face; these blotches touching at the sutures produce a continuous lateral band emarginated on each segment; segment 8 not distinctly blotched, but with narrow lateral black margin; segment 9 slightly emarginated, and with a brown blotch on each side; segment 1 especially, and segment 2 with an ill-defined median blotch of dark brown; the sutures between segments 2–7 showing except at lateral ends as uncolored lines; below, the lateral bands are narrower and not emarginated (or faintly on each segment); segment 1 with distinct median blotch, and segment 2 with a larger indistinct blotch; one or two hairs at posterior angles of segments; on segments 7–9 more hairs.

Male. Body, length 3.44 mm., width .59 mm.; head, length .72 mm., width 5. mm. Antennæ, first joint as long as all others combined, second next longest, third short with a dorsal angular projection at distal extremity, fifth slightly longer than fourth; first, fourth and fifth more colored than others. Abdominal segments with complete transverse dark brown bands, black at lateral margins, and with paler stigmatal spots; ninth segment very small and not emarginated.

Rudow (Zeitschr. f. ges. Naturwiss., 1870, vol. xxxv, pp. 121–137), describes several *Lipeuri* taken on *Procellaria*, and one, *nigricans*, is a form as dark as *celer*, but all of these species are small, *nigricans* being but 1.5 mm. long.

Lipeurus longipilus n. sp. (Plate vii, fig. 7.)

A few males and females taken from two specimens (out of ten shot) of the American Coot, *Fulica americana*

(Monterey, California). The species was not present on any one of five Coots taken at Lawrence, Kansas. A well-marked member of the group *clypeati sutura distincta*.

Description of the male. Body, length 2.4 mm., width .4 mm.; fuliginous with paler femora, antennæ, prothorax and posterior half of abdomen, and black marginal bands on head, thorax and abdomen.

Head, length .53 mm., width .35 mm.; elongate, conical, with narrowly parabolic front, four marginal hairs in front of suture and three behind it; temporal margins with one hair, occipital margin straight or feebly concave; no trabeculæ; eyes inconspicuous; antennæ, first segment short, second segment large, broadest at base, almost as long as third, fourth and fifth together, third deeply notched and with an acute claw-like extremity, fourth and fifth short, cylindrical and more strongly colored than other segments; signature shield-shaped, extending to front margin of head, pale-colored anteriorly, with indistinct transverse striæ parallel with anterior margin, dark brown behind, a distinct suture extending from posterior angle along the median line not quite to the anterior margin of signature; this suture also extending posteriorly almost to mandibles; antennal bands broad, dark and straight; temporal margins bordered with black, paling inwardly; an acorn-shaped occipital signature, apex forward.

Prothorax almost square, bare, with uniform lateral marginal black band, which bends inwardly at the posterior angle. Metathorax quadrangular, longer than broad; anterior angles diagonally truncate; a slight constriction behind the anterior angles; posterior margin straight, with three very long hairs and one shorter hair in each posterior angle; segment dark brown, with uneven lateral border of black, widest at constriction. Legs with dark colored coxæ and tibiæ, paler femora with darker markings.

Abdomen elongate, first segment much narrower than thorax at articulation, segments gradually widening to the fifth and narrowing from there to the ninth: segments 5–7 shorter than others; segments 1–2 with one hair at posterior angle, segment 3 with two hairs, and remaining segments with much longer hairs; distinct marginal black bands, with clear segmental spots; transversal dark brown bands, narrower on segments 5–7; ninth segment wholly colored and angularly emarginated, the points each with two short hairs.

Female. Body, length 2.65 mm., width .5 mm.; head, length, .55 mm., width .35 mm.; slightly larger than male; antennæ, second and fifth segments about equal, longest, third and fourth about equal; abdomen with segments gradually shortening from first backward through the seventh, eighth slightly longer, ninth deeply angularly emarginate, the two acute points without hairs: from the dorsal face of the eighth segment two very long hairs arise just inside of the black lateral band; all segments wholly colored except posterior half of the eighth; the transverse sutures uncolored, and indications of an uncolored median longitudinal line on segments 3–6; lateral marginal bands black, with clear stigmatal spots on inner margin.

Lipeurus picturatus n. sp. (Plate viii, figs. 1 and 2.)

Four specimens, all female, taken on two specimens of American Coot, *Fulica americana* (Monterey, California), out of ten shot. No specimens found on four Coots killed at Lawrence, Kansas. A finely-marked form, with indistinct suture.

Description of female. Body, length 2.1 mm., width .35 mm.; slender, parallel-sided, strongly marked with brown and black in regular blotches and bands.

Head, length .5 mm., width .32 mm.; elongate conical with narrowly rounding or parabolic front; a weakly projecting very obtuse angle at suture; six marginal hairs, of which four are grouped about this angle; trabeculæ small but distinct; temporal margins with one hair; occipital margin concave; antennæ uncolored; segments 1–4, beginning with 1, gradually shorter, fifth segment as long as second; signature broad, paler in front and with indistinct transverse striæ parallel with anterior margin, posterior margin concave, and with a broad, uncolored median line running from this border nearly to anterior margin; the signature is thus almost divided longitudinally; antennal bands black, extending anteriorly and fading into the paler color of the signature; temporal margins unevenly bordered with blackish, and bearing one hair; an acorn-shaped occipital signature indistinctly showing through from under surface.

Prothorax almost square, with posterior margin slightly angulated on the metathorax; clear smoky brown in middle, with black lateral borders expanded in anterior angles. Metathorax longer than broad, sides diverging slightly, anterior angles diagonally truncated with a distinct lateral angle; posterior margin straight; four hairs in posterior angle, three of which are in a clear space. Legs pale with smoky brown to black markings.

Abdomen slender, subparallel-sided, with single hairs at posterior angles, longer on posterior segments; segments 1–2 longest; others successively shorter; segment 9 deeply angularly emarginated, the points acute; first and ninth segments wholly colored; others, except segment 8 which has a curving, transverse band extending entirely across, with narrow marginal black bands, and two quadrangular smoky brown blotches separated from each other and from lateral band by uncolored spaces.

In an immature specimen (plate viii, fig. 2) of about same size as adults, the markings are less intensely colored, the occipital signature and precoxal lines of ventral surface showing through, and the segmental parts of the marginal abdominal bands distinct, so that each segment appears to have four blotches, the outer ones darker.

Lipeurus diversus n. sp. (Plate viii, figs. 3 and 4.)

Several specimens taken from the Black-vented Shearwater, *Puffinus opisthomelas* (Bay of Monterey, California). The species is very like, in outline and markings, Piaget's species *angusticeps* (Les Pediculines, p. 306, pl. xxv, fig. 4) from a *Thalassidroma leachi* (Zool. Garden of Rotterdam), but shows such marked difference in size and certain details that it must be looked on as a distinct species.

The measurements of the specimens are (following in parentheses are the corresponding dimensions of *angusticeps* as given by Piaget): Male, body, length 3.4 mm. (2.8 mm.), width .37 mm. (.30 mm.); head, length .7 mm. (.6 mm.), width .37 mm. (.28 mm.). Female, body, length 4.1 mm. (3.65 mm.), width .5 mm. (.46 mm.); head, length .72 mm. (.65 mm.), width .43 mm. (.37 mm.). The description of the species in general is that given for *angusticeps* differing as follows: Male, the posterior border of the signature angularly concave, not straight; the temporal margins with two short hairs instead of one; the antennal colored bands bending inwards at the clypeal suture and continuous with the internal bands which bound the oral fossa; the metathorax with five long hairs on posterior angles instead of two; the legs concolorous with the pale body color, not strongly colored; the last two segments of the abdomen not, as in *angusticeps*, with straight tapering sides bearing six short hairs and the last segment emarginated, but with convex margins with two or three rather long hairs, and the last segment very finely if at all emarginated. Female, the last segment of the abdomen not "*profondément entaillé*," but slightly and narrowly emarginated; also no median uncolored line on the first two segments.

Lipeurus limitatus n. sp. (Plate viii, figs. 5 and 6).

Three females taken from a Dark-bodied Shearwater, *Puffinus griseus* (Bay of Monterey, California). This species belongs to the group *clypeati sutura indistincta*, and is the first *Lipeurus* to be found on *Puffinus*.

Description of female. Body, length 2.75 mm., width .41 mm.; slender, parallel-sided, pale with light yellowish brown well defined markings.

Head, length .6 mm., width 4. mm.; elongate, conical, front rounded, with four short marginal hairs, one on dorsal surface between first and second marginal hairs, and one very short hair at antennal angle; trabeculæ wanting; temporal margins with one hair; occipital margin nearly straight; eyes inconspicuous; antennæ with second segment longest, first nearly as long, fifth slightly longer than either the third or fourth, which are equal, concolorous with the head or paler; whole head pale, yellowish brown, with darker marginal bands of forehead connected at front by paler striated clypeal band; a narrow, frontal margin of the clypeus transparent; the rest of the clypeus pale brown, hinder margin emarginated; a brown ocular blotch, and the temporal margins near the eyes feebly browner than head color.

Prothorax short, hexagonal, with latero-anterior margins short and hardly distinct from lateral margins; lateral margins narrowly darker colored than rest of segment; no hairs. Metathorax almost three times as long as prothorax; sides subparallel; hind margin feebly convex or slightly angulated on abdomen; with four long hairs and one short one in posterior angles, the short hair being next to the outermost hair; the lateral margins very narrowly darker edged along their hinder half. Legs concolorous with body, dorsally narrowly darker edged.

Abdomen slender elongate, subparallel-sided, growing slightly wider to segment 7, segments 8–10 tapering; segments 1–7 subequal in length, segment 8 half as long as segment 7, segment 9 shorter than segment 8; segment 10 obtusely two-pointed; very sparsely haired, segments 2–6 with one short hair on margin just in front of posterior angle; a square pale brown blotch on each side of segments 1–7, darker-edged outwardly, and separated by a distinct median uncolored line; blotches of segment 8 meeting, and the markings of segment 9 continuous.

Lipeurus constrictus n. sp. (Plate viii, figs. 7 and 8.)

Found on three out of six specimens of the Surf Scoter, *Oidemia perspicillata*, and on one out of six specimens of the White-winged Scoter, *Oidemia deglandi* (Bay of Monterey, California); also found on a specimen of *perspicillata* taken at Lawrence, Kansas (Kansas River, during migration). The new form belongs to the group *bisetosi*, and is distinguished from *squalidus*, the member of the group which the new form most resembles by the smaller size, by the narrow basal abdominal segments, and by the concave hinder margin of the clypeal signature. Many specimens, males, females and young were taken.

Description of the male. Body, length, 2.31 mm., width 5 mm.; general habitus of *squalidus*, but distinctly smaller and with waist-like narrow basal abdominal segments.

Head, length .53 mm., width .41 mm.; temporal margins with five very short stiff hairs or prickles and one longer hair; antennal bands most strongly marked at anterior end, ocular blotch dark brown, and temporal margin broadly banded with brown paling internally. Lateral bands of prothorax darkest at posterior angles. Metathorax with large, lateral, marginal, dark brown blotch in front of the middle, and margin behind the blotch dark brown; hairs seven, as in *squalidus*. Legs concolorous with body, tarsi and claws darker. First two abdominal segments much narrower than succeeding ones, segments 4–5 the widest; segments 3–6 with two hairs, a long one and a short one, at posterior angles; segment 9 feebly emarginated, thus obtusely two-pointed; segment 1 short, segments 2–3 longest and equal, segments 4–5 next longest and equal, segment 6 very short especially in middle, segments 7–8 equal; lateral marginal bands distinct, dark brown; within pale yellowish brown quadrangular blotches separated by uncolored median line on segments 2–4.

The female is larger; body, length 3.12 mm., width .66 mm.; head, length, .63 mm., width .5 mm.; first abdominal segments shorter, segments 2–7 about equal, segment 9 very slightly emarginated.

The young of this species, as probably of all *bisetosi*, show characteristic transparent, narrow, lateral, abdominal margins, and on segments 1–7 along the lateral third of the hinder margin of each segment a linear transparent space; no brown markings.

Lipeurus punctulatus of Rudow (Zeitsch. f. ges. Naturwiss., v. xxxvi, p. 137), from *Oidemia fusca* is probably an immature specimen of this species.

Lipeurus ferox Giebel. (Plate ix, figs. 1 and 2.)

Zeitsch. f. ges. Naturwiss., 1867, xxix, p. 195.

Pediculus diomedæ. Fabr. Ent. Syst., 1794, iv, p. 421.

Lipeurus diomedæ Dufour. Ann. Soc. Ent. France, 1834, iv, p. 669, figs. 1 and 2; Giglioli, Quart. Jour. Mic. Sci., 1864, iv, N. S., p. 19, plate i, b, figs. 1, 2.

Lipeurus pederiformis Dufour. Ann. Soc. Ent. France, 1834, iv, p. 676, pl. 26, fig. 4.

Lipeurus ferox Giebel. Insecta Epizoa, 1874, p. 235. Piaget, E. Les Pediculines, 1880, p. 333. Taschenberg, O., Die Mallophagen, 1882, p. 145, pl. v, figs. 1, 1a.

To this large and striking species may be attributed three specimens, one male and two females, taken from the Short-tailed Albatros, *Diomedea albatrus*. The male was taken from one bird, the two females from another; these two birds, both immature, were the only specimens of this bird species taken on the Bay of Monterey. The various descriptions of *ferox* by Giglioli, Giebel, and Taschenberg differ somewhat; Giebel had only a male before him; Taschenberg had in addition an immature female, and while Giglioli had both sexes his descriptions are incomplete.

Description of female. Body, length 9. mm., tapering from sixth abdominal segment abruptly to tip of abdomen, and gradually toward the head; strongly and distinctly marked with dark brown on both sides of the body for its whole length; a median uncolored line widest on head and on sixth abdominal segment; body nearly glabrous.

Head, length 2.1 mm., width 1.4 mm.; widest behind the eyes; margins of head in front of antennæ nearly straight and oblique; temporal margin feebly rounding; occipital margin weakly concave; clypeal suture distinct; clypeus convex in front, without hairs or bristles: at suture a slight rounded emargination, with one long hair, and behind it five short hairs, farther back one short hair, and in front of insertion of antennæ two short hairs; signature large, broadly triangular with rounded angles, front margin parallel with margin of clypeus; antennæ with first segment uncolored, the remaining four brown, segment 2 longest, segments 1 and 3 about equal, segment 5 shorter than segment 4, each segment with a few short hairs; angles of antennary fossæ not projecting; eyes prominent; temporal margin with a few very short bristles; head broadly margined, widest posteriorly, with dark brown; a dark brown band across the head immediately behind the clypeal signature.

Length of thorax 2.5 mm., width 1.9 mm.; prothorax forming a parallelogram a little wider than long, the angles weakly rounded; lateral borders dark brown, extending inward along the front and hind margins toward the middle, but not reaching it, leaving the middle third of the segment uncolored. Metathorax expanding posteriorly; lateral margins with some small, uneven, rounded projections about the middle; posterior margin slightly concave, angles acute; near each angle near the posterior margin a single pustulated hair, and a little further in seven long pustulated hairs grouped in a small, elliptical, uncolored space; the whole metathorax strongly brown except narrowly along the posterior margin and behind and at the sides of a central longitudinal brown quadrangle (the sternal blotch showing through). Legs strong, with elongate coxæ, very short thick tarsi, with short thick claws; everywhere dark brown, except at the basal and distal extremities of coxæ and femora and the tarsi; a few scattered hairs.

Abdomen, length 4.5 mm., width 2. mm.: widest at sixth segment, tapering sharply to posterior extremity; posterior lateral angles of one segment projecting over anterior lateral angles of succeeding segment: segment 1 shortest, segment 7 longest: color mostly dark brown, consisting of very dark lateral border and large transverse lateral blotches, those of segment 6 meeting at middle line, others not meeting; an uncolored, median, longitudinal line interrupted on segment 6; on ventral side transverse blotches continuous across all the segments; anterior and posterior margins of each segment narrowly uncolored; an ill-defined stigmatal uncolored spot on segments 2–7; segment 8 conical, much narrower than segment 7, and segment 9 very short and narrow, two-pointed, each point bearing two strong hairs; sparsely haired; posterior lateral angles of segment 1 with one hair, of segments 2–4 with two hairs, of segments 5–6 with three hairs, of segment 7 with four hairs; segment 8 with two strong hairs near anterior lateral angle, two shorter hairs on side and three separated, strong, pustulated hairs on each half of posterior margin.

The male specimen of *ferox* taken by me differs rather markedly in some respects from Taschenberg's careful description of the specimen in his hands. Indeed, it has been a question with me whether my specimens could fairly be attributed to this species.

Lipeurus forficulatus Nitzsch. (Plate ix, figs. 3, 4, 5 and 6.)

Zeitschr. f. ges. Naturwiss. (ed. Giebel), 1866, vol. xxviii, p. 386.

Lipeurus forficulatus Nitzsch, Giebel, Insecta Epizoa, 1874, p. 238; Taschenberg, Die Mallophagen, 1882, p. 157, pl. iv, figs. 6, 6a, 6b.

Taken from four of five specimens killed of the California Brown Pelican, *Pelecanus californicus* (Bay of Monterey, California), and on two White Pelicans, *Pelecanus erythrorhynchus* (Lawrence, Kansas), the parasites numerous on the birds. Nitzsch's specimens were taken from *Pelecanus onocrotalus* (locality?). My specimens show distinctly the short forked projection on the first segment of the antennæ of the male, the character noted by Taschenberg which distinguishes this species from the otherwise similar form *bifasciatus* Piaget, found on *Pelecanus crispus* (Zool. Garden of Rotterdam).

I figure both sexes, although Taschenberg's figure of the male is good. I figure also two stages of the young. The measurements of the specimens figured are as follows: Male, body, length 2.6 mm., width .62 mm.; head, length .52 mm., width .5 mm. Female, body, length 2.7 mm., width .9 mm.; head, length .56 mm., width .56 mm. Young female, body, length 2.28 mm., width .72 mm.; head, length .5 mm., width .48 mm. Very young, body, length 1. mm., width .44 mm.; head, length .375 mm., width .44 mm.

Lipeurus temporalis Nitzsch. (Plate x, fig. 1.)

Germar's Mag. Entomol., 1818, vol. iii, p. 292.

Ricinus mergi serrati De Geer, Mem. pour servir a l'hist. des Insectes, 1778, vol. vii, p. 78, pl. iv, fig. 13.

Pediculus mergi Fabricius, Species Insectorum, 1781, vol. ii, p. 480.

Lipeurus temporalis Nitzsch. Denny, Monograph. Anoplur. Brit., 1842, p. 175, pl. xiv, fig. 7; Giebel, Insecta Epizoa, 1874, p. 239; Piaget, Les Pediculines, 1880, p. 350, pl. xxxi, fig. 1.

Two females and a male taken from a Red-breasted Merganser, *Merganser serrator* (Bay of Monterey, California). The measurements of the female are: body, length 3.21 mm., width .9 mm.; head, length .7 mm., width .44 mm.

Male. Body, length 2.56 mm., width .5 mm.; head, length .66 mm., width .5 mm. Both Denny's and Piaget's figures are of the female. I figure the male.

Lipeurus testaceous Tschb. (Plate xi, figs. 2 and 4.)

Taschenberg, Die Mallophagen, 1882, p. 135, pl. v, fig. 3.

With some doubt I refer to this species five individuals taken from a Black-vented Shearwater, *Puffinus opisthomelas* (Bay of Monterey, California). Taschenberg's specimens, females only, were taken from *Procellaria capensis* (locality ?).

My adult specimens (three females) differ from Taschenberg's description in these details: the eye has a small hair not mentioned by Taschenberg; the front angles of the antennary fossæ are prolonged into small but distinct trabeculæ; there are five long hairs, not four, in the posterior angles of the metathorax, four hairs rising near together in a clear space and the fifth apart and near the lateral margin. I find distinctly in undoubted adult specimens the ten abdominal segments referred to by Taschenberg, who thought his specimens might be immature. The measurements agree well, those of the adult female figured by me being: body, length 2.50 mm., width .56 mm.; head, length .75 mm., width .53 mm. I figure an adult female and a very young.

Lipeurus toxoceros Nitzsch. (Plate x, figs. 3 and 5.)

Zeitschr. f. ges. Naturwiss. (ed. Giebel), 1866, vol. xxviii, p. 386.

Lipeurus toxoceros Nitzsch. Giebel, Insecta Epizoa, 1874, p. 237; Piaget, Les Pediculines, 1880, p. 343; Taschenberg, Die Mallophagen, 1882, p. 149, pl. iv, fig. 7.

Lipeurus gyroceros Nitzsch (ed. Giebel), Zeitschr. f. ges. Naturwiss., 1866, vol. xxviii, p. 386.

An adult male and two young taken on two specimens of Farallone Shag, *Phalacrocorax dilophus albociliatus* (Bay of Monterey, California), and one adult male from a California Brown Pelican, *Pelecanus californicus* (Bay of Monterey, California). The pelicans and cormorants congregate in great numbers on the same rocks in Monterey Bay, and it is not surprising to find a straggling individual of this cormorant parasite on a pelican. Nitzsch's specimen was collected on a *Halieus carbo*, and the specimen described by Nitzsch as *gyroceros*, but declared by Taschenberg to be identical with *toxoceros*, was found on *Halicus braziliensis*.

The adult male figured by me measured as follows: body, length 3. mm., width .8 mm.; head, length .62 mm., width .6 mm.; and the young as follows: body, length 1.9 mm., width .53 mm.; head, length .5 mm., width .5 mm.

Lipeurus squalidus Nitzsch. (Plate x, figs. 6 and 7.)

Germar's Mag. Entomol., 1818, vol. iii, p. 292.

Pediculus anatis Fabricius, Systema Entomologiæ, 1775, p. 345.

Lipeurus squalidus Nitzsch. Gurlt, in Mag. f. d. ges. Thierheilk., 1842, vol. viii, p. 425; Denny, Monographia Anoplurorum Britanniæ, 1842, p. 176, pl. xiv, fig. 5; Grube, Middendorff's Reise, 1859, vol. ii, p. 486; Nitzsch (ed. Giebel), Zeitschr. f. ges. Naturwiss., 1866, vol. xxviii, p. 385; Giebel, Insecta Epizoa, 1874, p. 241, pl. xvi, fig. 1; Piaget, Les Pediculines, 1880, p. 344, pl. xxx, fig. 5; Taschenberg, Die Mallophagen, 1882, p. 162.

This common species of the ducks has long been known, and is widely distributed geographically and zoologically. It has been taken on at least a dozen species of ducks, and what have been called varieties of it on still other species. The exact defining of *squalidus* has not yet been accomplished. Piaget declares that four resembling species *(sordidus, depuratus, frater* and *gracilis)* of Nitzsch and Giebel are simply *squalidus;* Taschenberg agrees with Piaget, and adds that Rudow's species, *rubromaculatus*, *punctulatus*, *cinereus* and *nyrocæ*, are, at best, but varieties of *squalidus*.

The evident truth is that the wide distribution of this duck parasite has resulted in the noting of the many variations normal to any animal species whose peculiar habits of life produce the comparative isolation of small groups of individuals. The common occurrence of the parasite and its hosts has resulted in its frequent capture, thus affording opportunity for the examination of many individuals widely separated geographically. It seems to me, under the circumstances, advisable to give a broad definition of the species, without attempting, as yet, to indicate varieties by name.

I attribute to this species specimens taken from a Bufflehead, *Charitonetta albeola*, Mallard, *Anas bosca*, and a Ruddy Duck, *Erismatura rubida*, all from Lawrence, Kansas. These specimens vary somewhat among each other, and all from the descriptions of Giebel and Piaget, which descriptions in turn do not agree with each other. The markings of the abdomen seem to be extremely variable, ranging from an indistinct lateral brownish coloration to distinct quadrangular, sharply-emarginated lateral blotches. More striking is the variation in number of the long hairs in the posterior angles of the metathorax. Piaget mentions two short ones, Giebel four, while all of my specimens show seven, varying in length and arranged as shown in figure 7, plate x. The specimen which I figure was taken from a Bufflehead, *Charitonetta albeola*, and will serve as a fairly representative illustration of the species for purposes of comparison. The measurements of this specimen are: body, length 3.3 mm., width .62 mm.; head, length .63 mm., width .44 mm.

Oncophorus advena n. sp. (Plate xi, figs. 1 and 2.)

A male and one female taken from the American Coot, *Fulica americana* (Bay of Monterey, California), and a male taken from a Pacific Loon, *Urinator pacificus* (Bay of Monterey, California). Can this last individual be a straggler? The female resembles the female of *Oncophorus minutus* Piaget, and was by me thought to belong to this species until I had found the male, whose appendaged antennæ make it impossible to refer the American specimens to this species. The female also on closer examination differs from the female *minutus* in its distinctly broader abdomen, by possessing four hairs on posterior angles and margin of metathorax instead of two, and by the absence of an uncolored median abdominal line. The new species by the character of the antennæ of the male belongs to the group *docophoroides*.

The genus *Oncophorus* was established by Rudow (Zeitschr. f. ges. Naturwiss., 1870, vol. xxxv, p. 175) for his *Oncophorus schillingi* since removed by Taschenberg to his genus *Eurymetopus*. Piaget has preserved the generic name *Oncophorus* but applies it to a group of widely removed *Nirmus*-like small forms. Eight species have been described, of which seven are found on wading birds. Piaget says of the genus that it serves as a natural transition between the genera *Docophorus* and *Nirmus* on one side, and *Goniodes* and *Lipeurus* on the other.

Description of the male. Body, length 1.15 mm., width .4 mm.; small, pale with dark brown lateral abdominal bands on all except last three abdominal segments.

Head, length .34 mm., width .32 mm.; front parabolic with a few short hairs rising from the dorsal surface on each side of the middle of the front projecting over the margin; trabeculæ short, wide at base appearing equilaterally triangular in shape; antennæ with first segment much enlarged, third segment with a distinct appendage, fourth shorter than fifth; eye at about middle of the head, flatly convex with a hair; temporal margins straight, diverging posteriorly with three short spiny hairs; in the posterior angles a very long strong hair, reaching to the posterior margin of the first abdominal segment; just behind this hair a spine, and on the occipital margin two short, strong, spiny hairs inserted even with the lateral margins of the prothorax; occipital margin sinuous; color, pale golden; antennal and ocular bands dark, subtranslucent and curving.

Prothorax, subquadrangular with anterior end projecting beneath the head, and anterior margin emarginated, posterior margin weakly convex; a long, strong hair in each posterior angle; pale golden, anterior angles darker. Metathorax not longer than prothorax, wider, with lateral angles rounded and with two long hairs inserted very closely together; on the posterior margin on each side two long hairs inserted very closely together; posterior margin convex and obtusely angulated on the abdomen; pale golden brown, with darker spots on anterior margin near the anterior angles. Legs concolorous with body, or slightly paler.

Abdomen short with subparallel sides, posterior angles projecting slightly, and with two or three rather long hairs; a double longitudinal line of weak hairs along dorsi-meson; lateral bands smoky brown fading out on posterior segments; last segment truncate behind, with a few very short inconspicuous hairs on posterior margin; genitalia distinct, with two backward projecting prongs and two longer forward projecting prongs reaching fourth segment.

Female, body, length 1.28 mm., width .5 mm.; head, length .4 mm., width .4 mm.; head less "square" in appearance, more tapering, temporal margins convex not straight; antennæ with second segment longest, third and fourth equal and fifth slightly longer than fourth; lateral bands of abdomen much more strongly marked and posterior angles of abdominal segments projecting more; last segment of abdomen rounding with slight emargination.

Eurymetopus taurus Nitzsch. (Plate xi, figs. 3, 4, 5 and 6.)

Zeitsch. f. ges. Naturwiss., 1866, vol. xxviii, p. 385 (ed. Giebel).

Philopterus brevis Dufour, Ann. d. l. Soc. Ent. France, 1835, vol. iv, p. 674, pl. xxxi, fig. 3.

Docophoroides brevis Giglioli, Quart. Jour. Mic. Science, 1846, vol. iv, p. 18, pl. i, B, figs. 3, 4.

Lipeurus taurus Nitzsch, Giebel, Insecta Epizoa, 1874, p. 234; Piaget, Les Pediculines, 1880, p. 332, pl. xxxi, fig. 3.

Eurymetopus taurus Nitzsch, Taschenberg, Die Mallophagen, 1882, p. 183, pl. v, figs. 8, 8a.

Many specimens, males, females and young, taken from two specimens of the Short-tailed Albatross, *Diomedea albatrus*, shot on the Bay of Monterey, California. Also found on two out of thirty specimens of the Pacific Fulmar, *Fulmarus glacialis* vars. *rodgersii* and *glupischa*, taken in the Bay of Monterey, California. This species has been found by Nitzsch, Swinhoe, Dufour and Meyer on *Diomedea nigripes*, *exulans* and *brachyura*. The specimens taken by me differ in some slight details from Taschenberg's careful description, notably in the longer and narrower signature and in their much smaller size, both males and females being less than three-fourths as large as the specimens (Nitzsch's) measured by Taschenberg, and about three-fourths the size of Piaget's specimens. The measurements of my figured specimens, as compared with Taschenberg's measurements, are as follows (Taschenberg's figures in parentheses): Male, body, length 3.12 mm. (4.13 mm.), width 1.18 mm. (1.75 mm.); head, length .9 mm. (1.25 mm.), width 1. mm. (1.52 mm.). Female, body, length 3.40 mm. (4.38 mm.), width 1.5 mm. (1.62 mm.); head, length .95 mm. (1.25 mm.), width 1. mm. (1.56 mm.). Taschenberg's figures are in bad shape; he evidently attributes to the male the measurements of the female and *vice versa*, as he makes the male the larger. In the above comparison I have transposed his figures. Also he attributes to the male (= female) a thorax almost twice as long as that of the female (= male)! This is an obvious error. Despite the conspicuous difference in size and a few other minor ones, I incline to attribute my specimens to Nitzsch's species rather than to call them new.

The blotches on the ventral side of the abdomen of the male, described by Piaget and said by Taschenberg to be wanting on his specimens, are plainly present in mine. As both Piaget and Taschenberg figure the male, I figure the female, the head of the male, and an immature male and immature female. This last shows an interesting stage in the formation of the lateral abdominal blotches, there being two blotches on the lateral portion of each segment, which fuse to form the large blotch of the adult stage. The short round abdomen and peculiar marking of the head are also striking. The measurements of the young female figured are: body, length 2.15 mm., width 1.25 mm.; head, length .65 mm., width .8 mm. The immature but nearly grown male is as large as the adults.

GIEBELIA gen. nov.

By this name (given in honor of Prof. C. G. Giebel) I would designate a *Docophorus*-like form of which several specimens (males and females) of a single species were taken from specimens of the Black-vented Shearwater, *Puffinus opisthomelas*. The distinguishing characters of the new genus are its *Docophorus*-like form, with very short, broad, suborbicular abdomen (in the single species yet known six-sevenths as broad as long); size of body and shape of abdomen same in both sizes; large head; produced rectangular anterior angles of temporal margins with the large eye in the angle; antennæ arising in an antennal emargination; conspicuous trabeculæ, a transparent, semilunar, transversal, membranous flap or process on the forehead with, in the male, a conspicuous, angulated, lateral lobe projecting over the lateral margin of the forehead about midway between the trabeculæ and the anterior angles of the clypeus, in the female barely produced beyond the margin; strong, obtusely toothed mandibles; labium with short but distinct apraglossæ with five short spines on tip of each; antennæ similar in both sexes; abdomen turbinated, with dark lateral bands and brown transverse bands.

Giebelia (nov. gen.) **mirabilis** n. sp. (Plate xi, figs. 7 and 8.)

Four males and five females taken from six out of seven individuals of the Black-vented Shearwater, *Puffinus opisthomelas*, shot on the Bay of Monterey, California. The only species of *Giebelia* yet found.

Description of the male. Body, length 1.28 mm., width .56 mm.; short, broad (abdomen six-sevenths as broad as long); pale ferrugineous with dark brown to black markings; abdomen with strongly colored lateral bands and paler transversal bands.

Head, length, .45 mm., width .45 mm.; front broad, truncate with very narrow uncolored margin; one short hair in anterior angle; on lateral margin in front of projecting transparent flap two short hairs; lateral projecting part of crescentic, transversal, transparent flap as long as from anterior margin of flap to anterior angle of clypeus; trabeculæ projecting as far as end of first segment of antennæ; antennæ rather long, slender, segments 1–2 about equal, longest, segment 2 shorter, segment 4 shortest, segment 5 almost as long as segment 2, all segments concolorous with head; sutures broadly uncolored; hind head broadly quadrangular; temporal margins subparallel with angulated anterior angles produced, and the large eye with a spine set at the angle; behind the eye a very short hair; farther back a short hair, and then two very long hairs; occipital margin straight, bare; four dark brown pointed papilla-like processes projecting upwards from dorsal surface of head, one at basal extremity of each antennal band, and one on each side in front of mandible; signature broad extending to mandibles; antennal bands dark brown, angulated, paler along lateral margins of clypeus in front of the flap; mandibles large and strongly colored, forming a broad dark brown transversal line connecting the antennal bands; occipital bands distinct, dark brown, diverging, black at base and biramose; suborbicular occipital signature with two short divergent posterior projections indistinctly showing through from under surface.

Prothorax short, broad; anterior angles, lateral margin and posterior angles rounded; a single hair at posterior angles; a broad, distinct, dark brown, lateral border. Metathorax broad, with angulated lateral margin, a pustulated hair and spine in each angle, and five more hairs, some pustulated and longer than the others, unevenly spaced along the lateral part of convex posterior margin; anterior portion of lateral margin with broad, distinct, dark brown border, with strongly colored process projecting posteriorly into the segment. Sternal markings composed of angulated intercoxal lines between meso- and meta-legs, and two small oblong spots darkest at posterior end on sternum between middle legs. Legs concolorous with body with narrow darker margins, tibiæ with three, short, strong spurs on distal extremity opposed to tarsal claws.

Abdomen short, broad, turbinated, with one or more hairs in each projecting posterior angle; a double row of short hairs down the middle of dorsal aspect; well defined, broad, black, lateral bands extending from segment 2 to segment 8, with uncolored stigmatal spots on inner margin of bands; a rather narrow, somewhat sinuous, brown, transverse bar extending across each segment from lateral band to lateral band; last segment with uncolored anterior angles and broad median blotch; rounded behind with a few short hairs; genitalia extending forward into segment 6, and with most distinct posterior portion (in last two segments) cordate.

Female, length 1.43 mm., width .62 mm.; head, length .5 mm. width .5 mm.; lateral portion of transparent lobe of forehead barely projecting over lateral margin of head; lateral bands of abdomen broadest anteriorly, narrow with inward projecting linear appendages on posterior segments; transverse bands darker in medial portion; last segment broad, flatly rounded.

Colpocephalum unciferum n. sp. (Plate xii, figs. 1, 2 and 3.)

Found on one out of five specimens of the California Brown Pelican, *Pelecanus californicus* (Bay of Monterey, California); and on one out of two specimens of the American White Pelican, *Pelecanus erythrorhynchus* (Lawrence, Kansas). This well marked species shows a resemblance to Giebel's (Nitzsch's) figure of *C. eucarenum* (Insecta Epizoa, pl. xiv, fig. 1), taken from *Pelecanus onocrotalus*, but Giebel's description (p. 276) is, if accurate, of some other species than that to which my specimens belong. Giebel affirms the head to be longer than broad, which is not the case with my specimens, and which would be, as Piaget says, characteristic. I cannot but make my specimens types of a new form.

Description of male. Body, length 2 mm., width .62 mm.; golden brown with dark brown abdominal bands and intense black head markings.

Head, length .44 mm., width .52 mm.; front very flatly convex, almost straight, with, on each side of middle line, a weak hair, a short thick pointed spine, a shorter hair, two longer hairs, a shorter hair, and in the expansion in front of the ocular emargination four rather stiff longish bristles, the second being the longest; palpi just projecting beyond the margin, and antennæ projecting by all of the last segment which is diagonally truncated; the eye is inconspicuous but double, the anterior half being the more prominent; in the ocular emargination several hairs, and a fringe of short thick-set hairs extending back to the middle of the temporal margin; on the temporal margin several prominent hairs, of which two are very long; occipital margin concave, bare; two large, black, occipital triangles extending forward, and paling and tapering rapidly, as occipital bands; a broad occipital black border connecting the triangles; large, black, ocular blotches, and an uneven, curving, dark brown, inner band, running from the ocular blotches to the frontal margin, the anterior end of these bands expanded and darker.

Prothorax short, angularly elliptical, with a series of seven hairs along each lateral half of the posterior margin, beginning with a short spiny hair in the apex of the lateral angle; whole segment pale golden brown, with a paler narrow transversal blotch in front of the middle. Metathorax short, broad, trapezoidal, lateral margin with short spiny hairs; color pale brown, darker laterally. Legs long, femora thickened, tibiæ slender, expanding distally, especially the tibiæ of the forelegs; tarsi one-half as long as tibiæ; color pale golden brown, with dark brown markings on dorsal aspect of femur and tibiæ.

Abdomen elongate, widest at fourth segment and gradually narrowing in both directions; ends of segments projecting on the sides and armed with stiff, sharp-pointed hairs, especially in posterior angles; segments 6–9 with a pair each of very long hairs; ninth segment broad and flatly rounded behind, posterior margin with several longish hairs; lateral ends of segments dark brown (dark region quadrangular) and a paler, transverse band running clear across each segment and covering all of its surface, paler in its median portion; sutures paler to uncolored.

Female, length 2.19 mm., width .62 mm.; abdomen rather fusiform in shape, segment 2 the widest; segment 9 elongate, tapering, with a series of six short, strong, recurved hooks on the front half of each lateral margin; posterior margin broadly obtusely angled and thickly beset with stiff hairs; from the middle of each lateral segmental margin arises a pair of long hairs; the lateral margins of the abdomen are darker, black in some specimens, than in the male.

An immature specimen, 1.56 mm. long, showed as its only markings the ocular blotches, the anterior ends of the inner bands and a short linear marking on occipital margin; all of these markings were distinct and black.

Colpocephalum uniforme n. sp. (Plate xii, fig. 4.)

A single female taken from an American Avocet, *Recurvirostra americana* (Lawrence, Kansas). This species closely resembles *grandiceps* Piaget (Les Pediculines, p. 558, pl. xlvi, fig. 7), taken on *Hæmatopus ostralegus*, but differs from it in the number and arrangement of the long hairs on the head, thorax and last abdominal segment, and in the markings.

Description of female. Body, length 2.34 mm., width .75 mm.; elongate, pale golden brown, with very little darker markings; the small ocular blotches, occipital margin, and narrow lateral margin of metathorax and abdomen black.

Head, length .4 mm., width .6 mm.; ocular emargination less deep than usual; front rounded, almost a semicircle, the contour being slightly irregular because of a small, medial, angled projection, and a shallow almost imperceptible concavity behind the slight but distinct, obtuse, anterior angles; four hairs between the medial frontal angle and the latero-anterior angle of which the last hair is the longest, a very short hair in the anterior angle and a hair just in front of the projecting palpus tip; four hairs, of which one is long, in the lateral angle in front of the ocular emargination; the eye large with a slight emargination, the front half projecting further than the posterior half; the hairs of the ocular fringe larger than usual, the fringe extending but slightly on the margin of the broad temporal region; temporal margin with three long hairs and several short ones; occipital margin concave, bare. Color of head pale golden brown, with small black ocular blotches and narrow black border on outer temporal and occipital margins; indistinct narrow brown occipital bands, the black occipital margin expanded at their bases.

Prothorax with a spine and long hair in produced lateral angles, and a number of long hairs in obtuse latero-posterior angles; the posterior margin seems to be bare; golden brown with small latero-anterior dark brown blotches and very narrow dark brown border between lateral and latero-posterior angles. Metathorax showing no marginal constriction at line of union of meso- and metathorax; sides bare; produced posterior angles with two long hairs and two stout spines; posterior margin straight, bare; whitish, with narrow dark brown to black lateral border expanded slightly in anterior angles. Legs concolorous with body with very narrow dark brown dorsal margins of femora.

Abdomen elongate with long hairs in posterior angle of segments, and short hairs along lateral margins; a narrow interrupted (by sutures) black marginal band, and faint golden brown, broad, transverse bands darker on posterior segments; last segment slowly tapering, broad and flatly convex behind, with transparent margin and fringe of fine sharp-pointed hairs.

The specimen is probably not adult, and the markings consequently less extensive than those of the adults.

Colpocephalum pingue n. sp. (Plate xii, fig. 5.)

Two males taken from one of the two specimens of the Short-tailed Albatross, *Diomedea albatrus*, shot on the Bay of Monterey, California. No *Colpocephalum* has hitherto been taken on an Albatross.

Description of male. Body, length 1.7 mm., width .62 mm.; short, broad, fuscous, with dark brown abdominal transverse bands, paler medially.

Head, length .28 mm., width .5 mm.; but little more than half as long as wide; front flatly rounding, with, on each side of the middle which is marked by a minute angular process, a short weak hair, a longer stiff spiny hair, then another similar one (adjacent to the projecting palpus), and on the lateral angle in front of the ocular emargination four hairs, of which two are the longest of the forehead hairs; the palpus and antenna projecting beyond margin, each by its last segment; the eye large, simple, filling the base of the ocular emargination and containing a distinct, divided, black fleck; the ocular fringe of hairs extending only to the posterior limit of the emargination; the temporal margin convex and with eight hairs of which three are long; occipital margin weakly concave with two hairs on each side of the middle. Color of head fuscous with a narrow black occipital margin expanded at the bases of the faintly discernible occipital bands; the ocular blotches large, black, extending along the posterior margin of the emargination as a narrow black border, and still more narrowly and unevenly margining the temporal region; the inner bands indistinct, chestnut brown.

Prothorax broad (three-fourths as broad as head), short, posterior border rounded with a series of seven strong hairs beginning in the apex of the lateral angle; color pale yellowish brown. Metathorax short, broad, expanding rapidly posteriorly, anterior angles rounded, posterior angles produced, acute, with a short spine and a strong, long hair which is the terminal one of a series ranged along the straight posterior margin of the segment; sides bare. Color of prothorax light brown with a narrow dark brown or black uneven marginal blotch and a broad and transverse band of fuscous. Legs concolorous with body, with dark fuscous markings.

Abdomen broadly ovate, posterior angles of segments slightly projecting with one or two strong hairs and adjacent short ones; a series of strong hairs along posterior margin of each segment, and numerous other shorter hairs; each segment except last with a lateral marginal curving black blotch produced inwardly; also a transverse fuscous band extending entirely across each segment paler medially and darker on segments 7 and 8; ninth segment large, broad, rounded behind, posterior margin with two pairs of strong hairs on each side of the middle, whole segment uniformly fuscous.

Colpocephalum timidum n. sp. (Plate xii, fig. 6.)

Two females from a Golden Plover, *Charadrius dominicus* Lawrence, Kansas. The new species resembles *ochraceum* Nitzsch (Germar's Mag. Entomol., 1818, vol. iii, p. 299), somewhat.

Description of female. Body, length 1.94 mm., width

.37 mm.; pale brown, with small black markings on head and thorax, and dark brown markings on abdomen.

Head, length .36 mm., width .53 mm.; palpi not projecting, antennæ slightly projecting; front bare; lateral margin in front of ocular depression with four hairs of which one is long; eye with slight but distinct emargination; ocular fringe distinct; temporal margin with four long hairs, of which one, the third, is very long, and a few short hairs; occipital margin concave; pale yellowish brown, with small dark brown to black ocular blotches, and narrow occipital border expanded at bases of the very faint occipital bands.

Prothorax, with spine and hair on lateral angles, and close to the angle on latero-posterior border a hair; in latero-posterior angles a single hair, and along rounded posterior margin two very short hairs and two longer ones; without dark markings, although the lateral angles and borders appear darker because of sternal markings showing through; also the median sternal blotch faintly showing through. Metathorax with angular emargination on sides showing line of fusion of meso- and metathorax; anterior angles rounded; sides bare; posterior angles with a spine and two strong hairs; anterior angles bordered with black; lateral margins unevenly bordered with brown in which there is on each side a short linear black mark cutting off the region of the posterior angles. Sternal markings consisting of a median blotch on prothorax, a paler and more indistinct large median blotch on metathorax, and dark intercoxal lines. Legs concolorous with body; all femora thickened.

Abdomen, nowhere strongly colored or marked; an uncolored longitudinal line running parallel with each lateral margin on segments 1–8; outside of this line on each segment an ill-defined fuscous blotch showing as its most distinct portion a short transverse line, especially noticeable on segments 1–6; the posterior angles of the segments, which hardly project, bear each a long hair, a very few scattered small hairs on lateral margin; numerous short non-pustulated hairs scattered over the surface of the body; last segment pale with two longish lateral marginal hairs, and convex behind with a short fringe of fine transparent hairs.

Colpocephalum funebre n. sp. (Plate xii, fig. 7).

Two females from two specimens of the Glaucous-winged Gull, *Larus glaucescens*, Bay of Monterey, California. This species resembles *fuscipes*.

Description of female. Body, length 3.1 mm., width 1.5 mm.; large with comparatively small head and thorax; dark brown, with black markings.

Head, length 5 mm., width .78 mm.; palpus barely or not at all projecting beyond margin of forehead; antenna projecting slightly; front flatly rounded with eleven hairs on each side between middle of front and ocular emargination, of those on the true front the second and fifth longer than the others and of those on the side one very long; ocular emargination deep, narrow; eye large, simple, hemispherical, the ocular fringe prominent; of the hairs on the temporal margin four are long; occipital margin not deeply concave, bare; color dark brown with a narrow black border extending more or less distinctly entirely around the head; on the sides of the forehead the border is broken into spots, and along the front it is sinuate and is narrowly margined in front by a pale, almost uncolored space; on each lateral region of the forehead there are three small circular uncolored spots from each of which arises a short hair; on under side of head, a distinct large occipital signature; narrow occipital bands bending outward anteriorly, and a narrow black line bounding the oral fossa.

Prothorax, narrow, short; lateral angles obtuse, produced, and with a spine and long hair; in latero-posterior angle a long hair, and in addition two posterior marginal hairs on each side of the middle; color dark brown with narrow black lateral border, and a very narrow transverse line across the segment in front of the middle. Metathorax, sides bare, posterior angles with two spines and a long hair; posterior margin with a few hairs; color dark brown with darker irregular broad lateral border and large trapezoidal median blotch (sternal marking showing through) limited to metathorax; a distinct paler-colored sutural line between meso- and metathorax, with slight angular emargination on the sides; mesothorax with a paler-colored narrow median line separating the dark quadrangular lateral blotches. Sternal markings consisting of a median irregularly octagonal blotch on prothorax, behind it a Y-shaped line running across mesothorax and connecting with a large pentagonal metathoracic blotch with apex directed anteriorly; in addition broad lateral and coxal borders. Legs long, fore femora greatly thickened, middle femora not so much so and hind femora but little thickened; with scattered prominent hairs; concolorous with body.

Abdomen, very large, elongate oval, with one long hair in posterior angles of segments and several short ones along sides and in angles; a series of about twenty pustulated hairs along posterior margin of segments 1–7; these series extending laterally only to a pale-colored longitudinal line running parallel with the lateral margin of body and about .16 mm. from it. Color dark brown, with narrow black lateral border interrupted by sutures; and extending in on each segment along posterior margins to the pale longitudinal line, and along anterior margin not quite to this line; broad transverse bands extending across each segment between the pale longitudinal lines; last segment with three blotches and rounded, hair-fringed posterior border.

Colpocephalum laticeps n. sp. (Plate xii, fig. 8.)

A single male specimen from an American Egret, *Ardea egretta* (Lawrence, Kansas). This small and well-marked species cannot be referred to any one of the *Colpocephali* described by Nitzsch from various species of *Ardea*.

Description of male. Body, length 1.72 mm., width .72 mm.; dark golden brown, abdomen with distinct dark fuscous transverse bands.

Head, length .31 mm., width .62 mm.; just twice as wide as long; front broadly rounded with hairs on each side of the middle, as follows: a very short one, another and another, all some distance apart, and in the lateral angle in front of the ocular emargination four, of which two are long; the eye undivided but with a faint medial emargination and with a single black fleck in it; the ocular fringe not extending on the temporal margin; this margin with several short, fine, stiff hairs and three unevenly long pustulated ones; also a long pustulated hair arising from nearly the center of the temporal region; occipital margin not deeply concave, with four hairs; color pale smoky brown, ocular blotch black, bordered irregularly with dark smoky brown which extends backwards as an indication of occipital bands and forward as a suggestion of inner bands; temporal margin narrowly bordered with blackish brown; occipital margin narrowly bordered with black, widest along middle third of head.

Prothorax comparatively long and narrow (the width is always greater than the length among the *Colpocephali*), with conspicuously obtusely produced lateral angles bearing a spine and a long hair; the lateral margin between this lateral angle and the rounded posterior angle slightly concave and bare; posterior angle with a long hair followed by a short stiff hair, and by three long pustulated hairs along each half of the posterior margin; color fuscous with a darker, narrow, transverse line before the middle, and two similarly colored, narrow, curving lines running subparallel with the lateral margins. Metathorax trapezoidal, with posterior angles projecting beyond the sides of the abdomen; these angles with some short stiff hairs and the first of a series of ten long hairs ranged along the posterior margin; lateral margins bare and with a slight constriction in front of the middle indicating the line of fusion of meso- and metathorax; color fuscous with darker, almost black, triangular blotch in posterior angles, and a rather broad, pale, almost uncolored transverse line at line of fusion of meso- and metathorax.

Abdomen rather broadly elliptical with projecting ends of segments; one long and several shorter hairs on each posterior angle, and a series of about twelve hairs along the posterior margin of each segment. Color pale at sutures, black interrupted (by sutures) lateral bands, and a dark brown transverse band extending entirely across each segment; ninth segment broadly rounded behind with narrow transparent margin thickly set with a fringe of short sharp-pointed transparent hairs.

Ancistrona gigas Piaget. (Plate xiii, figs. I and 2.)

Les Pediculines, Supplement, 1885, p. 117, pl. xii, fig. 8.

Several specimens, ♂, ♀ and ⊙, of this remarkable form from four individuals of the Pacific Fulmar, *Fulmarus glacialis* vars. *rodgersii* and *glupischa* (Bay of Monterey, California). Piaget described the species from a single female taken from *Procellaria glacialis*. His description is excellent. The males differ from the females very little, the recognizable character being the hairless condition of the posterior border of the last abdominal segment. On each lateral margin of this segment there is a small group of short uncolored hairs, rather thick at base. I figure the male and an immature specimen. The immature specimen is without markings, except for a black fleck in the posterior angle of head, and a weak indication of the prothoracic lines. The head and thorax are of pale brownish, the abdomen whitish tinged with buffy. The measurements of the specimens figured are as follows: Male, body, length 5.5 mm., width 2.65 mm.; head, length .7 mm., width 1.87 mm. Young, body, length 2.6 mm., width 1.2 mm.; head, length .5 mm., width 1. mm.

Trinoton lituratum Nitzsch. (Plate xiii, fig. 3.)

Germar's Mag. Entomol., 1818, vol. iii, p. 300.

Trinotum lituratum Nitzsch, Burmeister, Handbuch d. Entomologie, vol. ii, p. 441; Giebel, Insecta Epizoa, 1874, p. 260, pl. xviii, fig. 10.

Trinoton squalidum Denny, Monograph. Anoplur. Brit., 1842, p. 235, pl. xxii, fig. 3; Giebel, Insecta Epizoa, 1874, p. 259.

Trinoton lituratum Nitzsch, Piaget, Les Pediculines, 1880, p. 597, pl. xlix, fig. 7.

A few specimens taken from the Pintail, *Dafila acuta*, and the Buff-breasted Merganser, *Merganser serrator* (Lawrence, Kansas). Nitzsch's original specimen was found on *Mergus albellus*, and Denny's specimens were taken from *Anas clypeata*. Piaget found the species on *Dendrocygna arborea* and *Anser albifrons* (Zool. Garden of Rotterdam). The species is easily recognized by its short broad outline and its markings. The female figured by me measured as follows: body, length 2.1 mm., width .63 mm.; head, length .5 mm., width .63 mm.

Trinoton luridum Nitzsch. (Plate xiii, fig. 4.)

Germar's Mag. Entomol., 1818, vol. iii, p. 300.

(Louse of the Teal) Redi, Experimenta circa gen. Insectorum, 1686, pl. xii (or x?); Albin, Nat. Hist. of Spiders and other curious insects, 1736, pl. 46 (or 48?).

Trinotum luridum Nitzsch. Burmeister, Handbuch. d. Entomologie, vol. ii, p. 441; Giebel, Insecta Epizoa, 1874, p. 258, pl. xviii, fig. 7.

Trinoton luridum Nitzsch. Denny, Monograph. Anoplur. Brit., 1842, p. 234, pl. xxii, fig. 2; Piaget, Les Pediculines, 1880, p. 591, pl. xlix, fig. 3.

Trinoton gracile Grube. Middendorff's Reise, vol. i, p. 494, pl. ii, figs. 6 and 6a.

Trinoton conspurcatum Nitzsch. Gurlt, in Mag. f. d. ges. Thierheilk., vol. viii, p. 430, pl. iv, fig. 15.

I have taken this common parasite of ducks from the Shoveler, *Spatula clypeata*, the Buff-breasted Merganser, *Merganser serrator*, the Greenwinged Teal, *Anas carolinensis*, the Pintail, *Dafila acuta*, the Mallard, *Anas boscas*, the Widgeon, *Anas americana* (Lawrence, Kansas), and from the Ruddy duck, *Erismatura rubida* (Monterey, California). There is, as has already been said by Piaget, a considerable variation in the individuals of this species, especially in the extent and intensity of the abdominal markings. It seems hardly worth while in the present state of knowledge of the Mallophaga to attempt to indicate these varietal differences by name. The size varies somewhat markedly among individuals and the males are smaller than the females. The following are the measurements of two specimens, one a male taken from a Pintail, *Dafila acuta* (Lawrence, Kansas), and the other, whose measurements are enclosed in parentheses, a female (the specimen figured by me) taken from a Ruddy Duck, *Erismatura rubida* (Monterey, California): Body, length 4.3 mm. (5. mm.), width 1.19 mm. (1.56 mm.); head, length .7 mm. (.8 mm.), width 1. mm. (1.28 mm.).

An immature specimen taken from a Greenwinged Teal, *Anas carolinensis* (Lawrence, Kansas), is almost as large as the average adult, but is uniformly pale, faintly tinged with clear brownish, showing no markings except a distinct black ocular fleck and the brown mandibles. The dimensions of this specimen are: Body, length 4.5 mm., width 1.43 mm.; head, length .81 mm., width 1.28 mm.

Læmobothrium similis n. sp. (Plate xiv, figs. 1 and 2.)

A single specimen from an Eared Grebe, *Colymbus nigricollis californicus* (Lawrence, Kansas). This species is very like Piaget's *emarginatum* (Les Pediculines, 1880, p. 585, pl. xlviii, fig. 8), taken from *Gallinula hæmatopus* (Zool. Garden of Rotterdam), but lacks the occipital bands of the head, has more of the peculiar, short, flattened, stiff points on the front margin of the head, has a very differently shaped prothorax (if Piaget's descripiion and figure are accurate), lacks the strong markings of emargination, and is a slightly larger species. My specimen is probably not adult, but is of not earlier stage than the last nymphal one. Adult specimens will measure a little larger, and will be a little more strongly marked. This genus has not before been found on a pygopodous bird.

Female, body, length 4.4 mm., width .87 mm.; uncolored (weakly pale brownish) with narrow, sharp, brown markings on head and thorax.

Head, length 1. mm., width .78 mm.; ocular emargination slight, contraction of sides of head even with the mandibles strong, sides of forehead slightly converging; front with rounding emargination, angles rounding; on each side of the center of the emargination toward the angle are a short hair, a longer hair arising from ventral surface, two short flattened spines, and projecting over the margin between them a hair arising from the dorsal surface, a long hair, a very short weak hair, and beyond the apex of the angle two flattened spines, the second one longer, and a long hair; the front half of the convex margin of the antennal fossa bears one very long hair and four shorter hairs, and the hinder half three weak, equal hairs arising close together and projecting backwards; the temporal margins bear two long hairs and more than a dozen short, equal ones; occipital margin concave; eyes double, inconspicuous; antennæ concealed in fossæ but showing through, fourth segment subglobular; labial palpi, with thick segments of about equal length, third and fourth segments with a short hair at anterior outward angle; mandibles pale brown with teeth dark brown; ocular flecks black; antennal fossæ rimmed with brown and a curved band, convex behind, across the head between middle points of antennary fossæ; a narrow, long, pale brown triangle projecting back from middle of transverse curving band just described; no occipital bands; in front of mandibles a rounding, pointed, crescent-shaped fossa, convex anteriorly.

Prothorax, subquadrangular, with a narrow anterior neck-like portion which fits into the occipital concavity of the head, sharply set off by a constriction; the posterior margin deeply and broadly emarginate, leaving the posterior angles as obtusely pointed, backward projecting processes underlying the metathorax; behind the frontal constriction the margin is angulated and a long hair and a short one rise from the angle; two black flecks on the frontal margin, a black fleck on each side of the constriction, and a brown lateral marking extending a little way along the middle of the margin. Metathorax and mesothorax continuous in outline with the abdomen; mesothorax indicated by a very slight narrowing near the front of the combined segments; three longer hairs and seven short ones along the margin of the segment; two brown flecks on front margin, and the rounding anterior angles narrowly and weakly margined with brown. Legs, uncolored, except for pale brown at extremities of segments, and very narrow marginal lines; front margins of femora of middle and hind legs with four or five subequal prominent hairs and several very short ones.

Abdomen, parallel-sided for anterior half and then gradually tapering posteriorly; no marginal constrictions between segments; but one or two long hairs in each posterior angle; last segment with one strong long hair and one longer, weaker hair in each posterior angle and a series of six short, equal hairs along posterior margin; margin narrowly lined with pale, clear brownish, and within a parallel, narrow, uncolored line.

Læmobothrium atrum Nitzsch. (Plate xiv, fig. 3.)
Germar's Mag. Entomol., 1818, vol. iii, p. 302.

Pulex fulicæ Redi, Experimenta circa generationem Insectorum, 1686, pl. iv, fig. 1.

Læmobothrium nigrum Burmeister, Handbuch d. Entomologie, 1832, vol. ii, p. 442.

Læmobothrium atrum Nitzsch, Denny, Monograph. Anoplur. Brit., 1842, p. 240; Giebel, Insecta Epizoa, 1874, p. 253, pl. xviii, fig. 5; Piaget, Les Pediculines, p. 586.

A single specimen from an American Coot, *Fulica americana* (Monterey, California). The previously taken specimens have been found on *Fulica atra*, also probably one occurrence on *Podiceps rubricollis*. The descriptions vary somewhat and are incomplete, and Giebel's figure shows strange markings of head and thorax, but the large size and dark coloration of the entire body sufficiently identify the species. Giebel's measurements are far under those of my specimen, which are: body, length 8 mm., width 1.9 mm.; head, length 1.4 mm., width 1.17 mm.

Menopon navigans n. sp. (Plate xiv, figs. 4 and 5.)

Two males and a young female taken from a Short-tailed Albatross, *Diomedea albatrus* (Bay of Monterey, California). Piaget has found a *Menopon (affine*, Tijdschr. voor Ent., 1890, vol. xxxiii, p. 248, pl. x, fig. 3) on an Albatross *(Diomedea exulans*, a skin in the Leyden Museum), but my new species does not resemble *affine* particularly. *Affine* is a smaller species, with a head more than three-fifths as long as broad; the head of the new species is twice as wide as long.

Description of the male. Body, length 1.8 mm., width .75 mm.; head and thorax pale with dark brown markings; abdomen with large, brown, transverse bands, subparallel-sided; many long bending hairs.

Head, length .34 mm., width .66 mm.; semilunar, front with, on each side, three hairs (of which the second is not strictly marginal), then a very short prickle, then five hairs in front of the ocular region, of which three are long; palpi and antennæ projecting by the length of their terminal segments; temporal margin with two very long hairs, one half as long, two one-fourth as long, and a few short ones; occipital margin concave with four hairs on the middle third. Color, pale brown, darker medially, and with black ocular blotches, and a linear, black, occipital border.

Prothorax broad, short, with lateral angles much produced and bearing two long hairs and a spine; posterior margin flatly convex with ten hairs; color pale with a brown transverse line and brown lateral angles darkest outwardly, the margin of the latero-posterior sides being black. Metathorax short, as broad as prothorax, pentagonal, posterior margin straight with a series of hairs closely set, anterior angles and lateral borders expanding in posterior angles, black; a broad transverse brown band like those of abdomen, in front of which a narrow whitish space broadest medially. Legs concolorous with pale ground color of body, with hairs and thickened femora.

Abdomen oblong, with convex sides and ends, all the segments except 9 being of approximately equal width; especially long hairs in posterior angles and shorter hairs on surface; each segment except 9 with broad transverse brown band covering nearly whole surface of segment and darkest along posterior margin; lateral extremities of bands dark brown to black, forming narrow interrupted lateral bands; segment 9 wholly colored, paler than transverse bands, large, rounding with numerous long hairs.

Menopon indistinctum n. sp. Plate xiv, figs. 6 and 7.)

Two females taken from an American Avocet, *Recurvirostra americana* (Lawrence, Kansas). This species most clearly resemble *crocatum* Nitzsch (ed. Geibel, Zeitschr. f. ges. Naturwiss., 1866, vol. xxviii, p. 392), from a *Numenius arquata* and *Hæmatopus ostralegus* (Piaget), but there are differences quite as considerable as those which have been used by Giebel and Piaget to separate the various *Menopon* species found on the shore birds. *Crocatum*, *lutescens et. al.* ought, perhaps, to be grouped together as a single species with several varieties, as is done for *Docophorus communis*, the common *Docophorus* of the passerine birds. However I add this species from our Avocet to the group which must sometime be well revised. The noticeable differences between this new species and *crocatum* lie in the number and disposition of the hairs of the head and thorax. The species does not at all resemble Nitzsch's species from the European Avocet, *Recurvirostra avocetta* (*micrandum*, Zeitschr. f. ges. Naturwiss. ed. Giebel, 1866, vol. xxviii, p. 392), which has a thorax without hairs, and an abdomen with uncolored longitudinal lines.

Description of female. Body, length 1.80 mm., width .7 mm.

Head, length .28 mm., width .5 mm.; semilunar; twice as wide as long, front with two short hairs at the middle, and on each side in front of the ocular region two short hairs and a long one; palpi slightly projecting; ocular margin straight or very faintly concave; temporal margin with four long pustulated hairs and several short ones; occipital margin concave with one long pustulated hair on each side; head golden brown with fuscous clouding, occipital margin and ocular fleck black; curving line bounding inwardly the antennal region black inwardly shading into dark brown outwardly; a transversal line even with the mandibles and expanded at outer ends, dark brown.

Prothorax, seven-eighths as broad as head, lateral angles very obtusely rounded, almost truncate, with two spines and a long hair; behind the angle on latero-posterior side a spine, then two hairs, and on the straight posterior margin three hairs on each side of the middle; color smoky brown with a distinct transverse darker line in front of the middle and not reaching the lateral margins; outside of each end of this line a short, slightly curving, longitudinal, dark line; the latero-posterior sides narrowly edged with black. Metathorax just as wide as head, narrow anteriorly with rapidly diverging sides, mesothorax distinctly separated by marginal constriction and dark transverse line; posterior angles of mesothorax bare, sides of meso- and metathorax bare; posterior angles of metathorax with a spine and the terminal one of a series of hairs ranged thickly along the weakly convex posterior margin; metathorax with a broad, transverse, fuscous band across posterior half. Sternal markings composed of small median blotch on prothorax with lateral linear processes; a small pointed blotch with two diverging very small linear processes projecting anteriorly, the whole between strongly curving, inwardly produced intercoxal lines, on mesothorax; and a larger median blotch, truncate behind, convex before, with two small linear points near the posterior angles of median blotch, on metathorax; a smaller semilunar median blotch on first segment of abdomen is also apparaent; the blotches of metathorax and first abdominal segment are beset with numerous short pustulated hairs. Legs pale smoky brown, with darker markings.

Abdomen, elongate oval, posterior angles of segments 1–3 projecting a little; the others barely or not at all; a rather long hair and some shorter ones in each angle: also a series of hairs in small pustulations along the posterior margin of each segment; all segments with a broad, distinct, light fuscous, transverse band whose extreme outer margins are darker; the bands separated by wide, uncolored, sutural lines; last segment, broad, short, uncolored, posterior margin concave with a series of fine short hairs.

Menopon numerosum n. sp. (Plate xv, fig. 1.)

An abundant parasite of the Pacific Fulmars, *Fulmarus glacialis* vars. *glupischa* and *rodgersii*, taken on twenty-four out of thirty specimens shot on the Bay of Monterey, California.

Description of male. Body, length 1.44 mm., width .62 mm.; pale yellowish to reddish brown, with transverse abdominal bands, separated by broad, white, sutural bands.

Head, length .28 mm., width .50 mm.; front very obtusely but distinctly angled with two short hairs on each side of the median angle; three long hairs and three short ones before the slight ocular emargination; a sparsely set ocular fringe of short stiff hairs, and in the temporal angles four long hairs and several short ones; occipital margin broadly and shallowly concave and with four hairs; dark brown ocular blotches, distinct black flecks in the eyes, and a narrow, dark brown, occipital border.

Prothorax with posterior margin broadly and evenly rounded with fourteen long hairs in a series extending from lateral angle to lateral angle; a narrow transverse line in front of the middle and a short longitudinal line at each end of the transverse line; the lateral angle regions slightly darker than rest of segment. Metathorax with diverging sides, straight or very flatly convex posterior margin; along the sides three short spines, of which the first two project upwards and the third outwards beyond the margin; in the posterior angles are two long hairs, then a short spine, and then a series of twelve long, strong hairs ranged along the posterior margin. Legs concolorous with body.

Abdomen elongate ovate, with long hairs in the posterior angles of segments and a series of long hairs along the posterior margin of each segment; ground color whitish showing in broad, transverse sutural bands; each segment with a pale, reddish brown, transverse band, darker and with a subtransparent, curving space at each end; posterior margin of last segment smoothly rounded with a few rather long weak hairs.

Female larger, length 2. mm., width .78 mm.; head, length .3 mm., width .53 mm.; abdomen more elongate, last segment less broadly rounded, and with a narrow, transparent, posterior border thickly fringed with fine transparent hairs.

Menopon infrequens n. sp. (Plate xv, fig. 5.)

A single female taken from a Glaucous-winged Gull, *Larus glaucescens* (Bay of Monterey, California).

Description of female. Body, length 2 mm., width .81 mm.; brown with chestnut, transverse abdominal bands, narrow black lateral bands, and broadly linear, diagonal, black, ocular blotches.

Head, length .31 mm., width .62 mm., thus being just twice as wide as long; brown with darker fuscous clouds; narrow black occipital margin; black ocular blotches in the form of diagonal bars; some indefinite pale to uncolored spaces, as in the posterior angles, along the front, and a more definite circular space containing a long hair and a spine on each side of the forehead just outside of the origin of the labial palpi; on the front four short hairs near the middle, and on the sides in front of the ocular region two short hairs and one longer but weak hair; temporal angles with three long hairs, one one-half as long and some shorter hairs; occipital margin with four pustulated hairs; on ventral aspect occipital bands showing, enclosing an orbicular occipital signature, with a series of five pustulated hairs along the lateral margins.

Prothorax, with fourteen long, pustulated hairs extending in series from lateral angle to lateral angle along the posterior margin, which in its middle third is almost straight; ground color of segment largely clouded with fuscous to dark brown, especially in lateral angle region, which is very narrowly margined with black; the usual transverse line in front of middle with curving longitudinal lines at the ends especially distinct. Metathorax with lateral emargination and dark brown sutural lines separating mesothorax; posterior margin straight, with a series of not very long hairs, and two or three hairs and a spine in the posterior angles; a fuscous transverse band across posterior half of segment, with its lateral margins black. Sternal markings composed of a small trapezoid on prothorax with the posterior angles produced, and a broad blotch on metathorax; the anterior coxæ are produced forward and backward into broad lobe-like appendages, rounded in front and angulated behind. Legs concolorous with ground color of the body, with darker margins.

Abdomen, elongate ovate, with one long hair and several short ones rising on margin just in front of each uncolored posterior angle, and a series of hairs along posterior margins of segments; segments 1–8 with a broad, transverse, fuscous band darker at lateral extremities and black on extreme lateral margins; segment 9 uniformly colored, broadly rounded with narrow, uncolored, fringed, posterior margin.

Menopon loomisii n. sp. (Plate xv, fig. 6.)

Specimens taken from two specimens of the White-winged Scoter, *Oidemia deglandi* (Bay of Monterey, California). Named after Mr. Leverett M. Loomis, Curator of Birds, California Academy of Sciences.

Decription of female. Body, length 1.8 mm., width .84 mm.; pale golden brown to pale chestnut brown.

Head, length .3 mm., width .56 mm.; semilunar with evenly rounding front, shallow ocular emarginations, and rounded posterior angles; occipital margin concave; palpi projecting by the length of the last segment; the antennæ when outstretched projecting beyond the margin of head by the length of the last segment; a pair of very small hairs in middle of front, a longer one on side followed by a very short one, and then two or three longer ones in front of the emargination; the ocular fringe composed of few but rather strong hairs longer than usual; temporal margins with three very long hairs and two more on occipital margin of the produced temples; four additional hairs on the occipital margin; a small, black, ocular fleck, dark brown ocular blotch, the mandibles black-tipped, the other mouth-parts and the basal segments of the palpi brown.

Prothorax with produced lateral angles obtuse, bearing two spines and a long hair, which is the terminal one in a series of fourteen ranged along the rounded posterior margin of the segment; the transverse line with curving vertical lines at its extremities is distinct. Metathorax with divergent sides, not quite as wide as head, with flatly convex posterior margin bearing a series of long hairs; in each lateral angle several small spines and the terminal hair of the posterior series. Legs concolorous with body; with scattered, rather long hairs.

Abdomen ovate, with broad transverse bands across all segments separated by wide uncolored sutures; in the anterior angles of each transverse band a small curving comma-like chitinous band; the segments with fine hairs on lateral margins, and longer weak hairs in the posterior angles; dorsal surface with hairs.

Menopon titan Piaget. (Plate xv, fig. 2.)

Les Pediculines, 1880, p. 503, pl. xl, fig. 7.

Tetraopthalmus chilensis Grosse, Zeitschr. f. wiss. Zool., 1885, vol. xlii, p. 530.

Many specimens of this species, or of a variety, found on four of five specimens examined of California Brown Pelican, *Pelicanus californicus* (Bay of Monterey, California), and on the White Pelican, *Pelicanus erythrorhynchus* (Lawrence, Kansas). These large conspicuous parasites are found not alone among the feathers of the host but also abundantly clinging to the inner surface of the gular pouch, a circumstance which suggests that feathers may not constitute the exclusive food of the parasites.

Piaget has described two species of these giant *Menopons* of the Pelicans, viz.: *titan* found on *Pelecanus ono-*

crotalus (Zool. Garden of Rotterdam) and *consanguineum* (Les Pediculines, Supplement, 1885, p. 116, pl. xii, fig. 7) found on *P. erythrorhynchus* (dried skin in Museum of Leyden). Picaglia has described a third species *ragazzi* (Atti d. Soc. d. Nat. d. Modena, 1885, serie iii, vol. ii) found on *P. trachyrhynchus* (Callao), and has established the subgenus *Piagetia* for the group. The characters of the subgenus are as follows: "abdomen narrow and very elongate; male longer than female; length more than 5 mm." The remaining members of the genus *Menopon* present in contrast these characters: "abdomen oval-elongate, rounded oval, or almost round; male smaller than the female; length varying from 1 to 3 mm." The species chiefly used by Franz Grosse in his study of the anatomy of the Mallophaga was a member of this *Menopon titan* group, taken from a Pelican, undetermined, from Chile.

It certainly seems advisable to indicate the peculiar characters of the group by assigning to it a subgeneric name; but I can hardly recognize in Picaglia's description of *ragazzi* characters other than the dimensions which make it recognizably distinct from *titan*. My specimens from *Pel. erythrorhynchus* show the slight variations from *titan* indicated by Picaglia in his description of *ragazzi*, but the dimensions are quite as large as those of *titan* (Picaglia made *ragazzi* one-fourth shorter than *titan*)! My specimens from *Pel. californicus* closely correspond with Piaget's description of *titan*, except that the transverse abdominal blotches are not bifurcated at the extremities. I believe that the present knowledge of the group hardly justifies any separation of the known forms into distinct species, but that the presence of these variations may be recognized by letting *titan* stand as the representative form of the species (*consanguineum* is evidently a distinct species, the equality in size of both sexes re-moving any likelihood of confusing it with *titan*), and by designating *ragazzi* and my specimens as varieties presenting the following diagnostic characters:

Var. *ragazzia* Picaglia, from *Pelecaus trachyrhynchus* (Callao); small, length of male 3.42 mm., of female 3.15 mm.; mesothoracic suture indistinct; metathorax a little wider than the head; general color paler than *titan*.

Var. *impar* Kellogg, from *Pelecanus erythrorhynchus* (Lawrence, Kansas); with the minor differential characters of *ragazzi*, but almost as large as *titan*; length of male 4.7 mm., of female 3.8 mm.

Var. *linearis* Kellogg (Plate xv, fig. 2), from *Pelecanus californicus*; about same size as *titan*; length of male 5.2 mm., of female 4.2 mm.; transverse abdominal blotches not bifurcated at extremities, and the longitudinal uncolored lines beyond spiracles very distinct in female, forming an interrupted, uncolored, longitudinal line for full length of abdomen, setting off lateral abdominal bands which are darker than the other abdominal markings.

Menopon tridens Nitzsch. (Plate xv, figs. 3 and 4.)

? Germar's Mag. Entomol., 1818, vol. iii.

Læmobothrium tridens Nitzsch. Zeitzschr. f. ges. Naturwiss. (ed. Giebel), 1866, vol. xxviii, p. 396.

Menopon scopulacorne Denny. Monograph. Anoplur. Brit., 1842, p. 221, pl. 18, fig. 9.

Menopon tridens Nitzsch. Burmeister, Handbuch. d. Ent., 1832, vol. ii, p. 440; Giebel, Insecta Epizoa, 1874, p. 296, pl. xvii, fig. 9; Piaget, Les Pediculines, 1880, p. 479, pl. xxxix, fig. 1.

I have taken several specimens of a *Menopon* from Coots, Grebes, and Loons and from a single Tern, which are referable to this species, or at least to the group of forms of which *tridens* is the described representative. The descriptions of *tridens* by Piaget and by Giebel differ positively in various particulars, noticeably in the characters of the hairs. My specimens agree exactly with neither of these descriptions, and besides differ among themselves in size and shape of head to such a degree that I have arranged them in three groups to which I give, tentatively, varietal rank. These varieties are as follows:

Var. *pacificum* Kellogg, from the Pacific Loon, *Urinator pacificus* (Bay of Monterey, California), and from five specimens out of ten of the American Coot, *Fulica americana*, shot near Monterey, California, and on two specimens out of five of the same bird species from Lawrence, Kansas; measurements, female, length 1.65 mm., width .62 mm.; head, length .28 mm., width .5 mm.; smaller than the succeeding variety which it otherwise resembles.

Var. *insolens* Kellogg (plate xv, figs. 3 and 4), from an Eared Grebe, *Colymbus nigricollis californicus* (Bay of Monterey, California), and from a Forster's Tern, *Sterna forsteri* (Lawrence, Kansas); measurements, female, length 2. mm., width .72 mm.; head, length .31 mm., width .53 mm.; markings distinct and dark; lateral bands of abdomen nearly black.

Var. *par* Kellogg, from a Western Grebe, *Æchmophorus occidentalis* (Lawrence, Kansas); measurements, female, length 2. mm., width .78 mm., head, length .31 mm., width .56 mm.; decidedly paler colors.

As already mentioned none of these varieties agrees with Piaget's or with Giebel's description of the species. The notable differences lie in the dimensions, in the presence through all of the varieties of six hairs on the occipital margin (Giebel says four; Piaget says two); and similarly through all the varieties the clear brown color of the lateral abdominal bands instead of an uncolored condition as affirmed by Piaget. The specimens of Piaget were taken from *Gallinula chloropus;* and his variety *major* based simply and certainly insufficiently on a difference in size amounting to but one-tenth of a millimeter in total length in the female and half that in the male, was taken on *Fulica atra*. Nitzsch found the species on *Fulica atra*, *Gallinula chloropus*, *Crex porzana*, *Podiceps auritus*, *Podiceps cristatus*; Denny found his *scopulacorne* on *Rallus aquaticus*, *Podiceps minor* and *Gallinula chloropus*. The species is easily recognized by the peculiar trilobed process, function unknown, on the under side of the hind-head (see fig. 4, pl. xv).

EXPLANATION OF PLATES.

PLATE II.— Fig. 1, Alimentary canal and salivary glands of *Menopon mesoleucum* (after Nitzsch). Fig. 2, Alimentary canal of *Docophorus fusicollis* (after Nitzsch). Fig. 3, Nervous system of *Lipeurus baculus*(?) (after Nitzsch). Fig. 4, Female genitalia of *Menopon mesoleucum* (after Nitzsch). Fig. 5, Male genitalia of *Menopon pallidum* (after Nitzsch). Fig. 6, Respiratory system of *Menopon titan* (original). Fig. 7, Head, under side, of *Læmobothrium* sp. (after Grosse). Fig. 8, Labium of *Tetraopthalmus chilensis* [=*Menopon titan*(?)] (after Grosse). Fig. 9, Labium of *Nirmus* sp. (after Grosse). Fig. 10, Antenna of *Tetraopthalmus chilensis* [=*Menopon titan*] (after Grosse). Fig. 11, Antenna of ♀ *Lipeurus*. Fig. 12, Antenna of ♂ *Lipeurus*. Fig. 13, Leg of ♂ *Tetraopthalmus chilensis* [=*Menopon titan*].

PLATE III.—Fig. 1, *Docophorus calvus* Kell., ♀. Fig. 2, *D. fuliginosus* Kell., ♂. Fig. 3, *D. graviceps* Kell., ♂. Fig. 4, *D. acutipectus* Kell., ♀. Fig. 5, *D. quadraticeps* Kell., ♀. Fig. 6, *D. montereyi* Kell., ♂. Fig. 7, *D. occidentalis* Kell., ♀. Fig. 8, *D. kansensis* Kell., ♀. Fig. 9, *D. atricolor* Kell., ♂.

PLATE IV.—Fig. 1, *Docophorus icterodes* N., ♀. Fig. 2, *D. pertusus* N., ♀ Fig. 3, *D. pertusus* N., juv. Fig. 4, *D. lari* Denny, ♀. Fig. 5, *D. insolitus* Kell., ♀. Fig. 6, *D. melanocephalus* Burm., ♀.

PLATE V.—Fig. 1, *Nirmus præstans* Kell., ♂. Fig. 2, *N. præstans* Kell., ventral aspect abdomen of ♂. Fig. 3, *N. hebes* Kell., ♀. Fig. 4, *N. farallonii* Kell., ♀. Fig. 5, *N. orarius* Kell., ♀ (?). Fig. 6, *N. giganticola* Kell., ♂. Fig. 7, *N. bœphilus* Kell., ♀.

PLATE VI.—Fig. 1, *Nirmus punctatus* N., ♀. Fig. 2, *N. punctatus* N., juv. Fig. 3, *N. felix* Giebel, ♂. Fig. 4, *N. felix* Giebel, ventral aspect abdomen of ♂. Fig. 5, *N. signatus* P., ♂. Fig. 6, *N. pileus* N., ♀. Fig. 7, *N. lineolatus* N., ♂. Fig. 8, *N. lineolatus* N., ventral aspect abdomen of ♂. Fig. 9, *N. lineolatus* N., juv.

PLATE VII.—Fig. 1, *Lipeurus densus* Kell., ♀. Fig. 2, *L. densus* Kell., ventral aspect head and thorax of ♀. Fig. 3, *L. varius* Kell., ♀. Fig. 4, *L. varius* Kell., juv. Fig. 5, *L. celer* Kell., ♂. Fig. 6, *L. celer* Kell., ♀. Fig. 7, *L. longipilus* Kell., ♂.

PLATE VIII.—Fig. 1, *Lipeurus picturatus* Kell., ♀. Fig. 2, *L. picturatus* Kell., ♀ juv. Fig. 3, *L. diversus* Kell., ♂. Fig. 4, *L. diversus* Kell., ♀. Fig. 5, *L. limitatus* Kell., ♀. Fig. 6, *L. limitatus* Kell., outline of metathorax to show arrangement and character of hairs. Fig. 7, *L. constrictus* Kell., ♀ juv. Fig. 8, *L. constrictus* Kell., ♂.

PLATE IX.—Fig. 1, *Lipeurus ferox* Giebel, ♀. Fig. 2, *L. ferox* Giebel, ♂. Fig. 3, *L. forficulatus* Nitzsch, ♀. Fig. 4, *L. forficulatus* Nitzsch, ♂. Fig. 5, *L. forficulatus* Nitzsch, juv. Fig. 6, *L. forficulatus* Nitzsch, very young.

PLATE X.—Fig. 1, *Lipeurus temporalis* Nitzsch, ♂. Fig. 2, *L. testaceous* Tschb., juv. Fig. 3, *L. toxoceros* Nitzsch, juv. Fig. 4, *L. testaceous* Tschb., ♀. Fig. 5, *L. toxoceros* Nitzsch, ♂. Fig. 6, *L. squalidus* Nitzsch, ♀. Fig. 7, *L. squalidus* Nitzsch, posterior margin of metathorax showing arrangement and character of hairs.

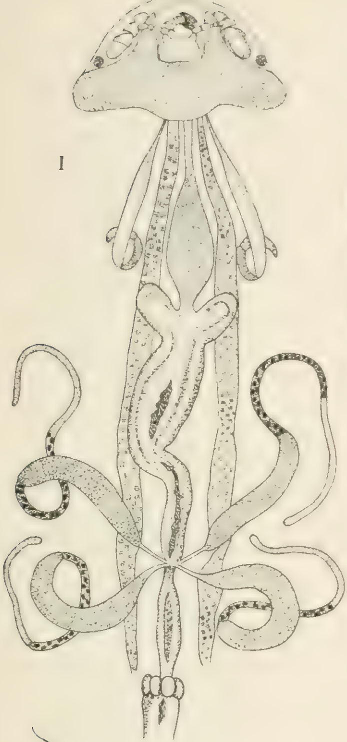
PLATE XI.—Fig. 1, *Oncophorus advena* Kell., ♀. Fig. 2, *O. advena* Kell., head of ♂. Fig. 3, *Eurymetopus taurus* Nitzsch, ♀. Fig. 4, *E. taurus* Nitzsch, head of ♂. Fig. 5, *E. taurus* Nitzsch, ♀ juv. Fig. 6, *E. taurus* Nitzsch, ♂ juv. Fig. 7, *Giebelia mirabilis* Kell., ♂. Fig. 8, *G. mirabilis* Kell., outline of head of ♀.

PLATE XII.—Fig. 1, *Colpocephalum unciferum* Kell., ♂. Fig. 2, *C. unciferum* Kell., outline and last segments of abdomen of ♀. Fig. 3, *C. unciferum* Kell., juv. Fig. 4, *C. uniforme* Kell., ♀. Fig. 5, *C. pingue* Kell., ♂. Fig. 6, *C. timidum* Kell., ♀. Fig. 7, *C. funebre* Kell., ♀. Fig. 8, *C. laticeps* Kell., ♂.

PLATE XIII.—Fig. 1, *Ancistrona gigas* Piaget, ♂. Fig. 2, *Ancistrona gigas* Piaget, juv. Fig. 3, *Trinoton lituratum* Nitzsch, ♀. Fig. 4, *Trinoton luridum* Nitzsch, ♀.

PLATE XIV.—Fig. 1, *Læmobothrium similis* Kell., ♂. Fig. 2, *L. similis* Kell., ventral aspect of head of ♀. Fig. 3, *L. atrum* Nitzsch, ♀ (?). Fig. 4, *Menopon navigans* Kell., ♂. Fig. 5, *M. navigans* Kell., juv. Fig. 6, *M. indistinctum* Kell., ♀. Fig. 7, *M. indistinctum* Kell., ventral aspect of thorax of ♀.

PLATE XV.—Fig. 1, *Menopon numerosum* Kell., ♀. Fig. 2, *M. titan* var. *linearis* Kell., ♂. Fig. 3, *M. tridens* var. *insolens* Kell., ♀. Fig. 4, *M. tridens* var. *insolens* Kell., ventral aspect of head of ♀. Fig. 5, *M. infrequens* Kell., ♀. Fig. 6, *M. loomisii* Kell., ♀.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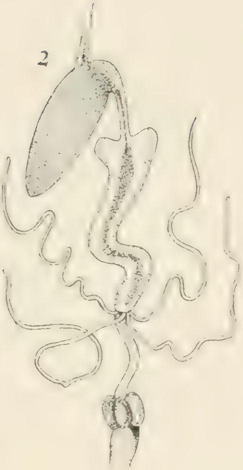
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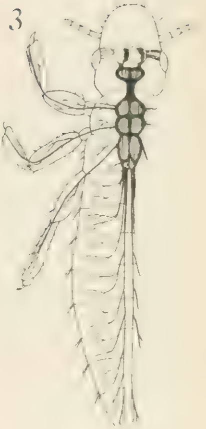
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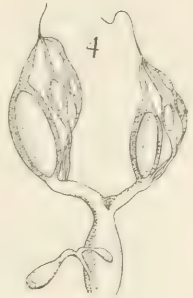
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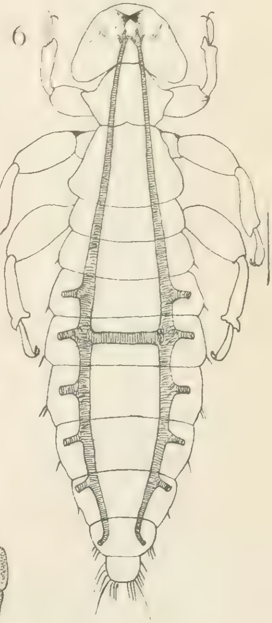
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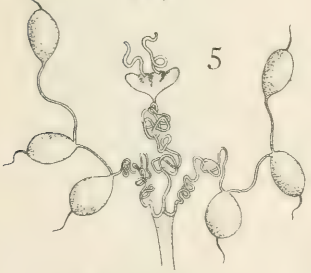
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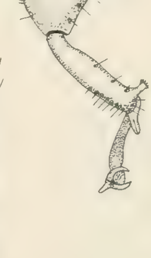
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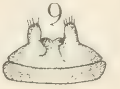
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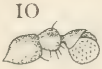
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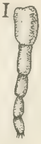
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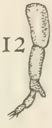
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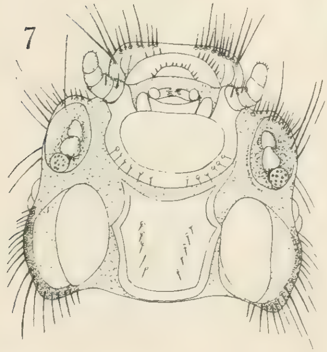
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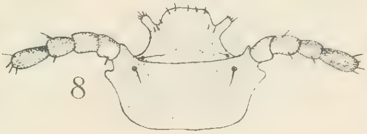
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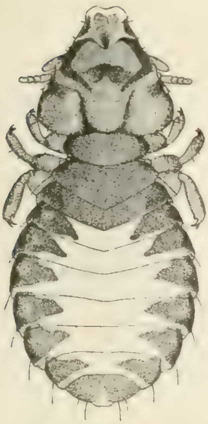
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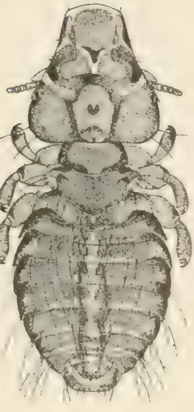
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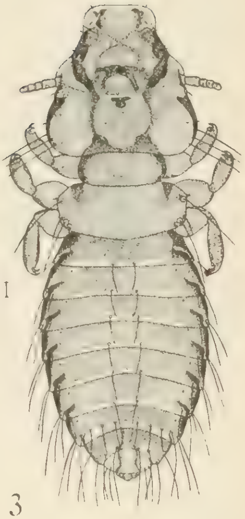
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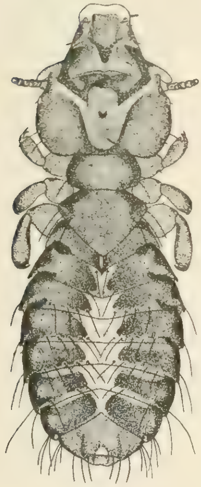
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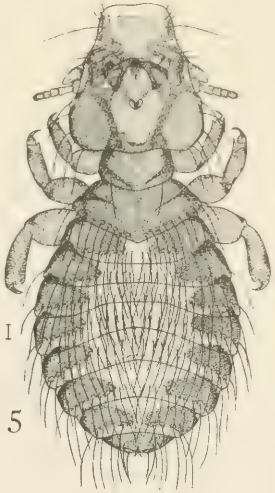
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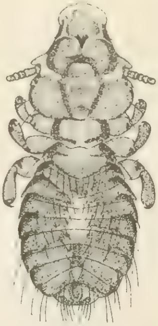
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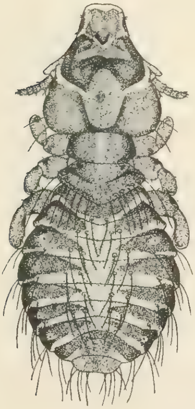
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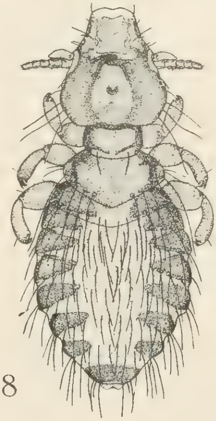
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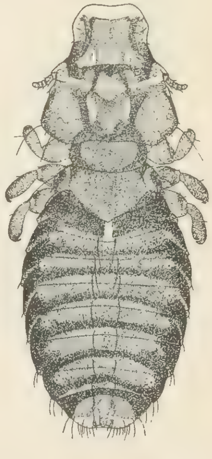
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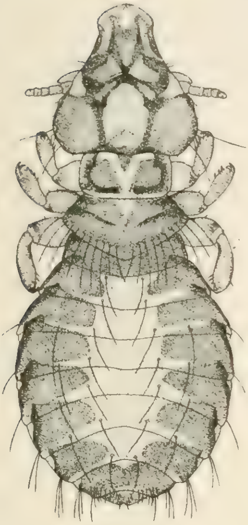

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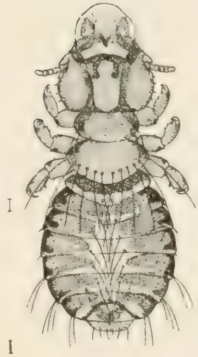

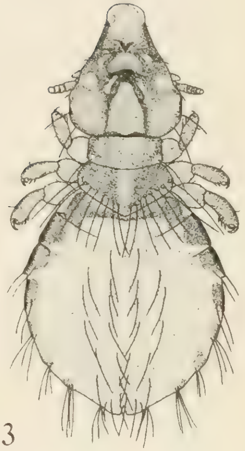

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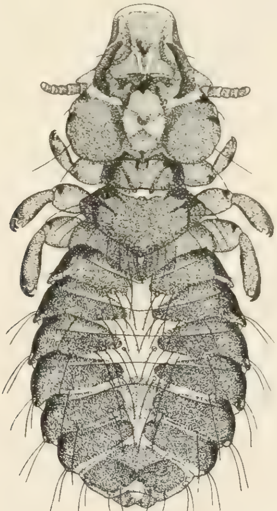

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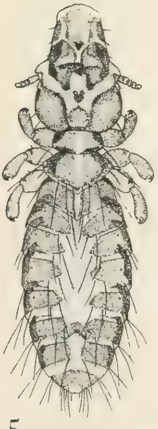

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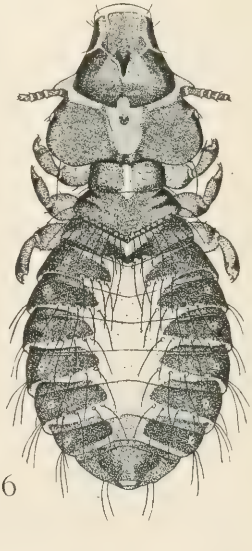

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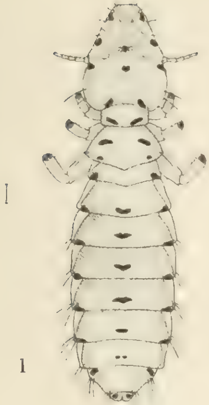
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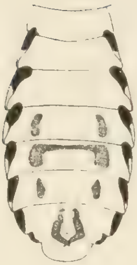
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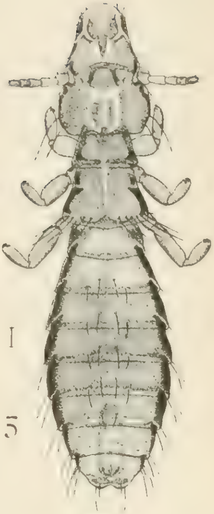
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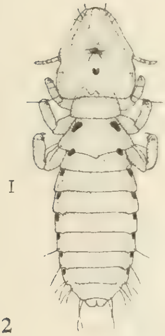
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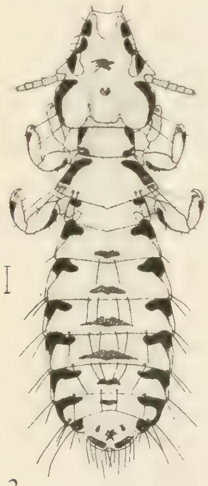
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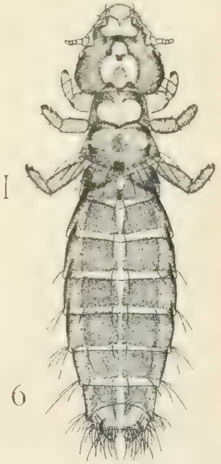
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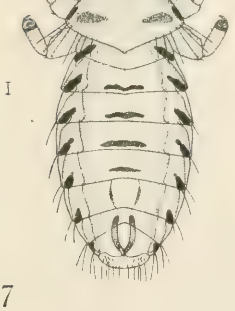
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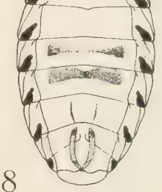
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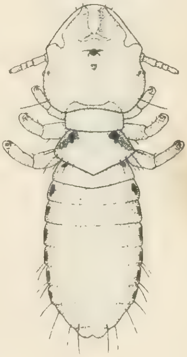
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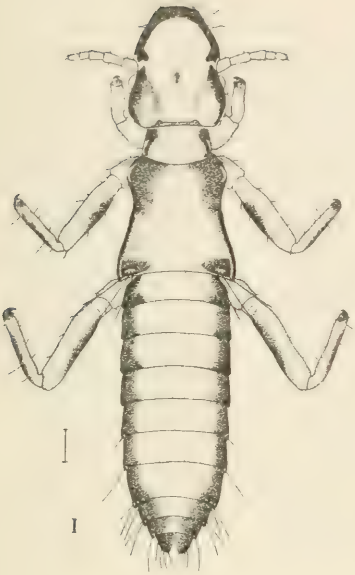

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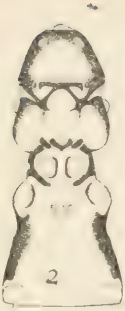

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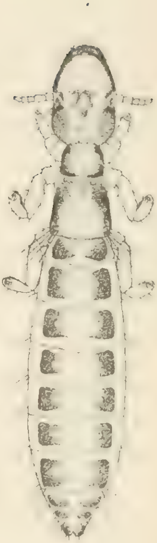

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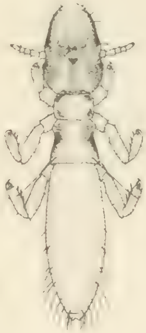

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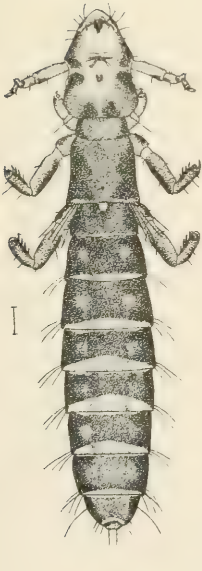

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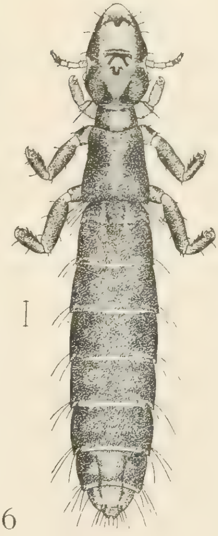

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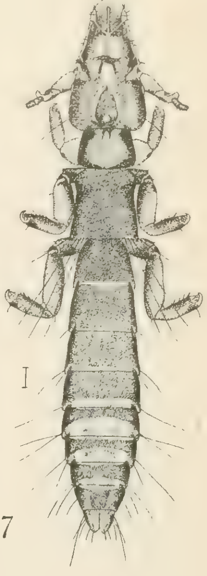

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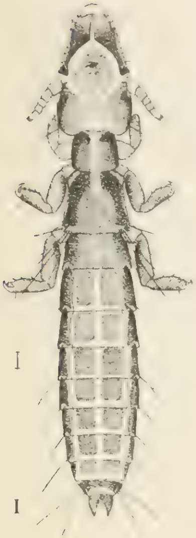

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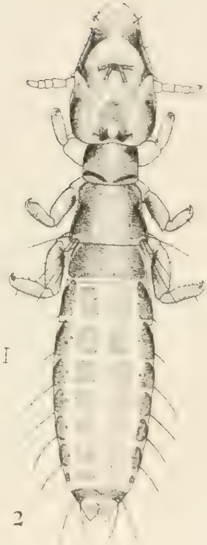

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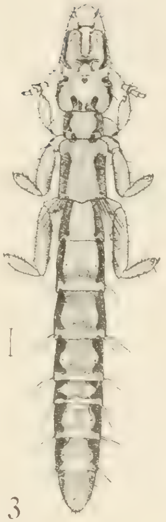

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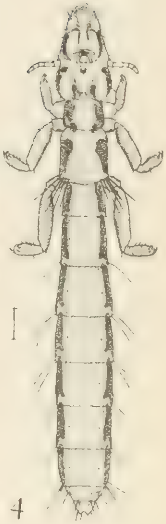

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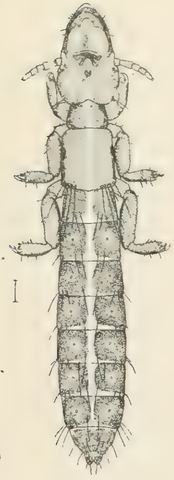

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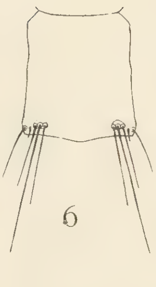

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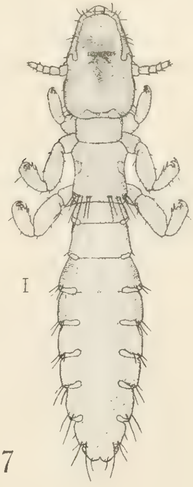

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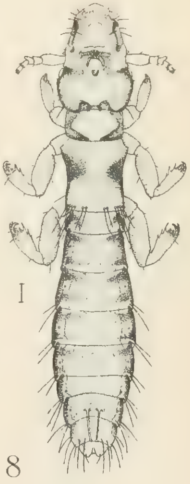

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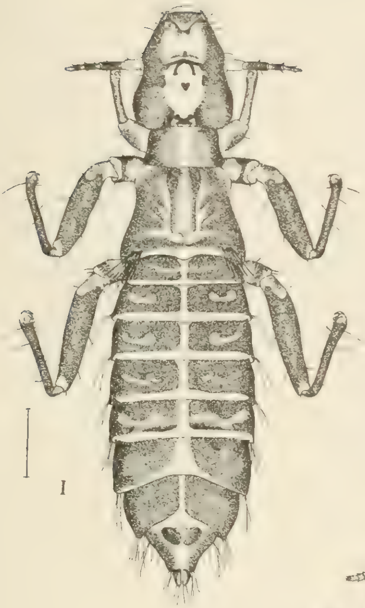
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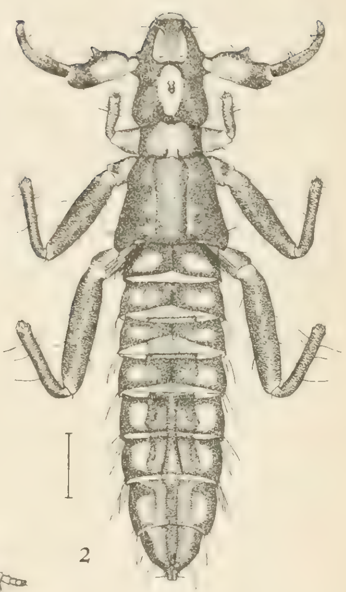
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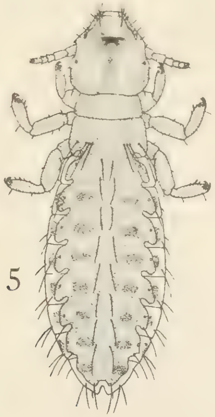
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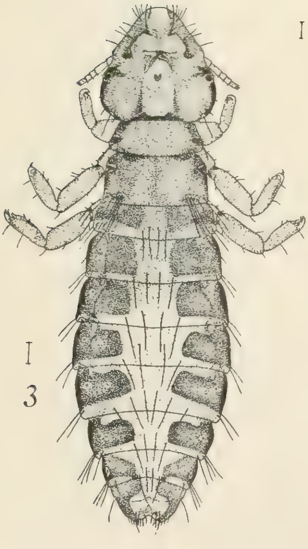
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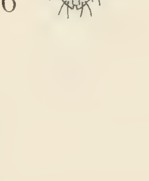
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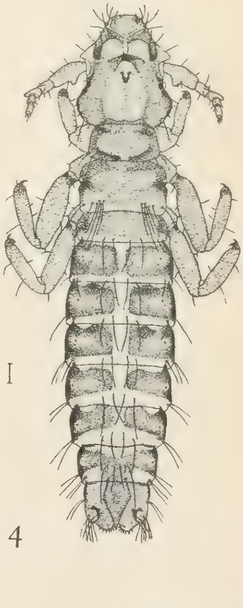
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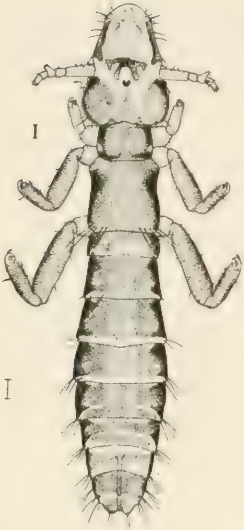

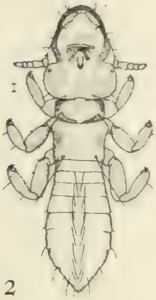

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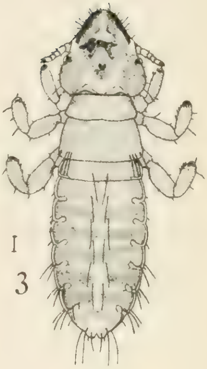

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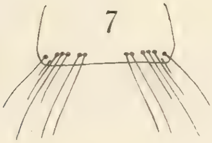

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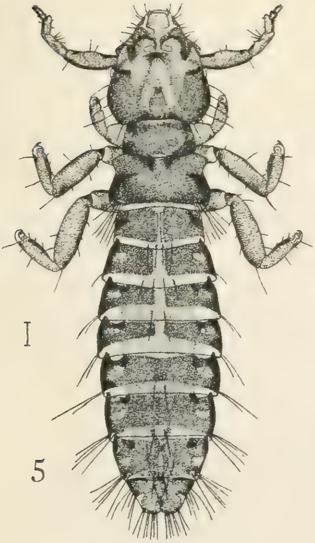

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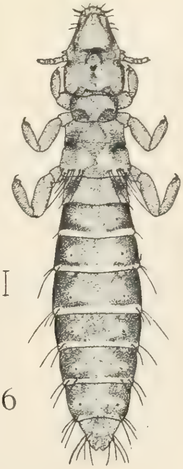

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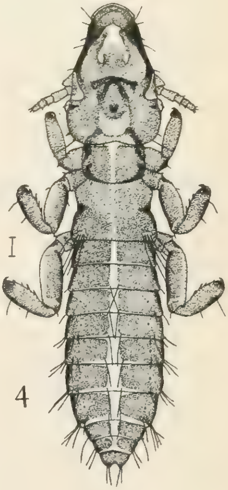

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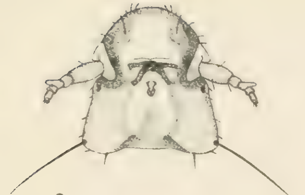
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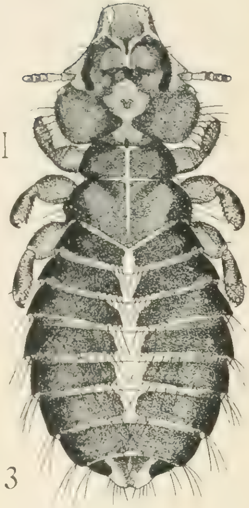
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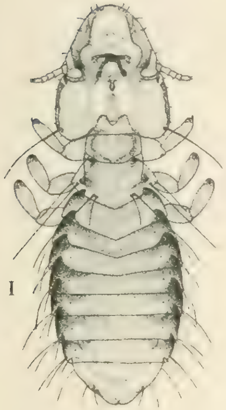
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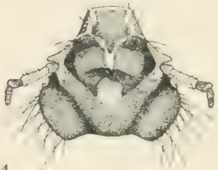
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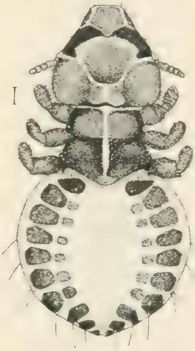
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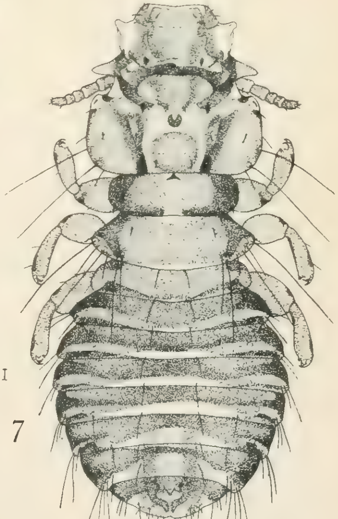
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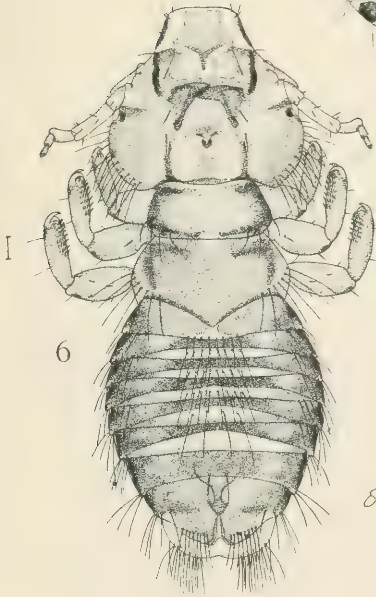
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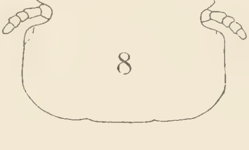
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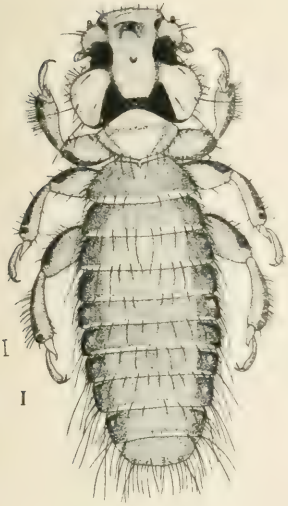

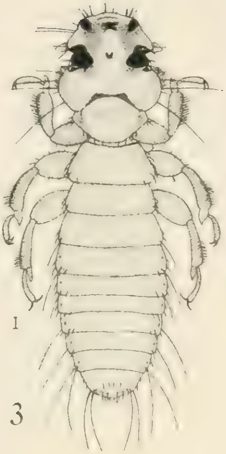

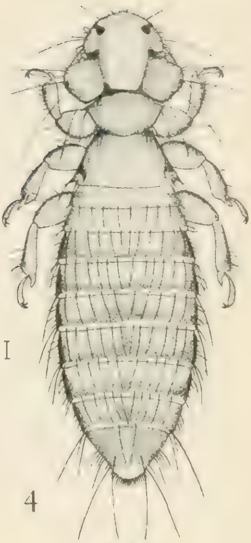

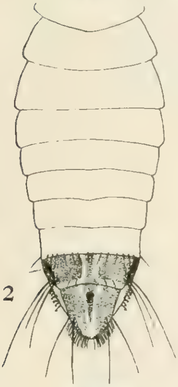

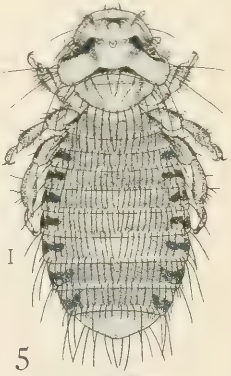

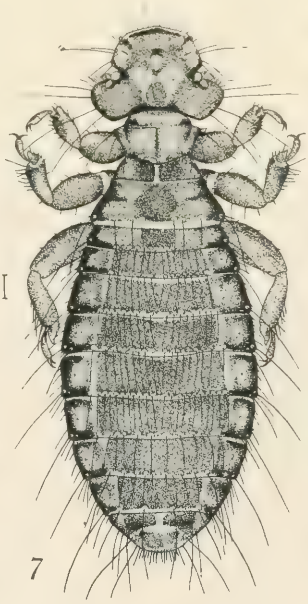

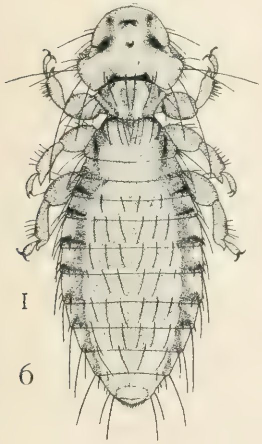

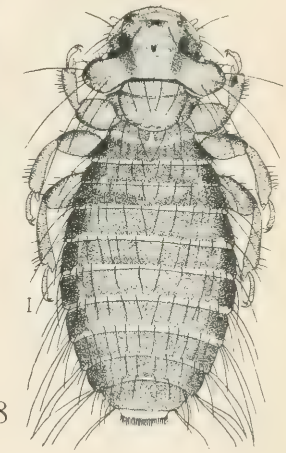

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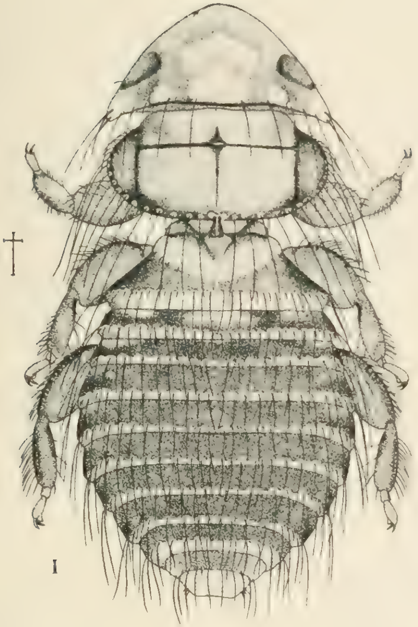

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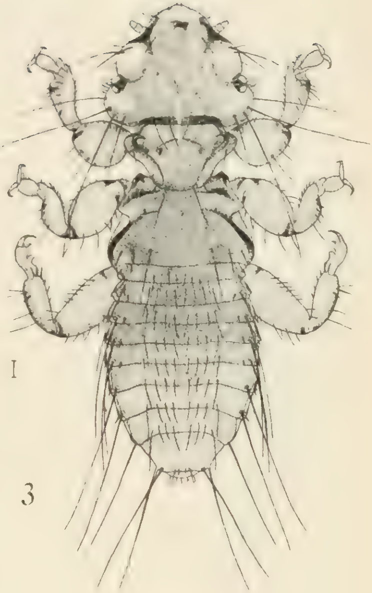

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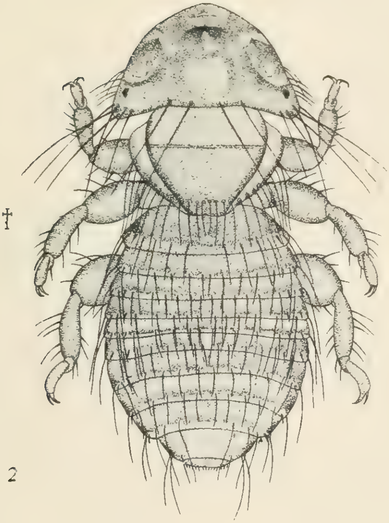

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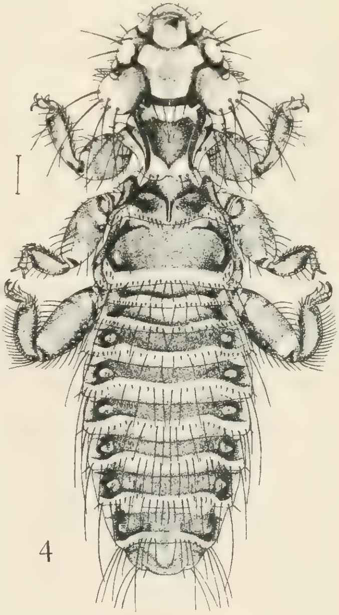

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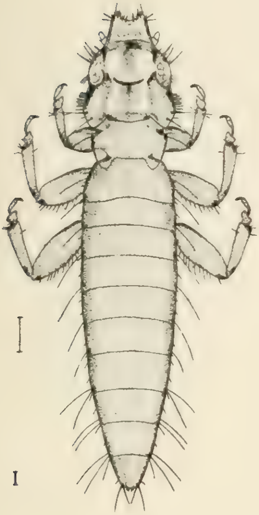

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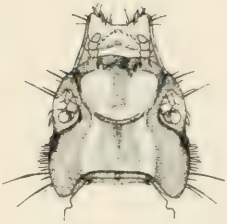

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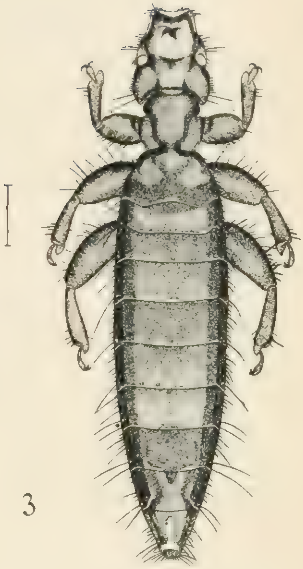

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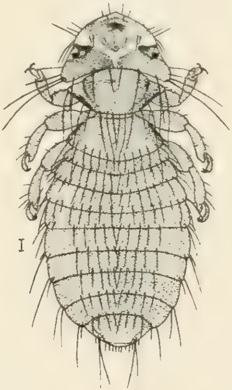

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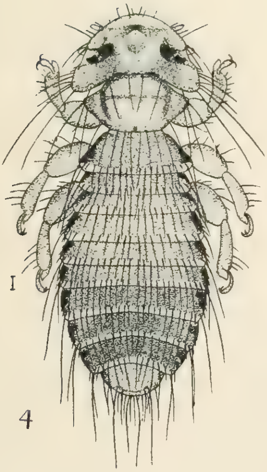

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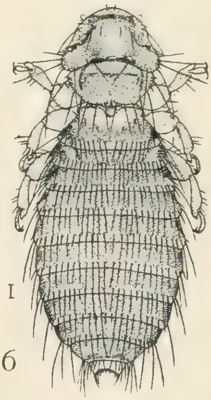

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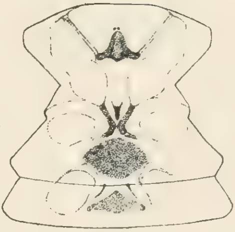

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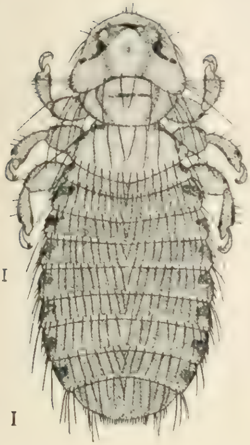
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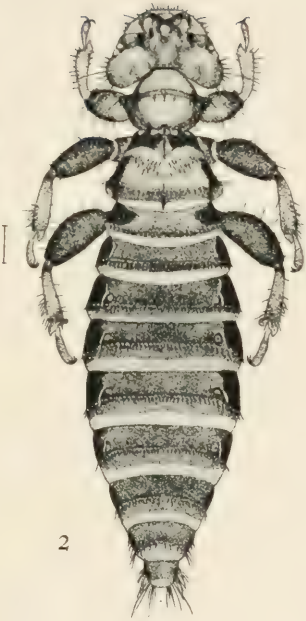
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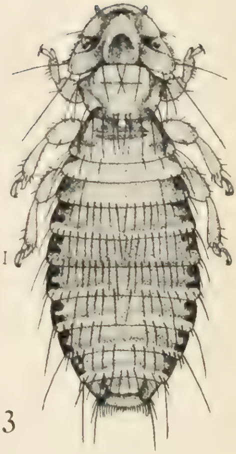
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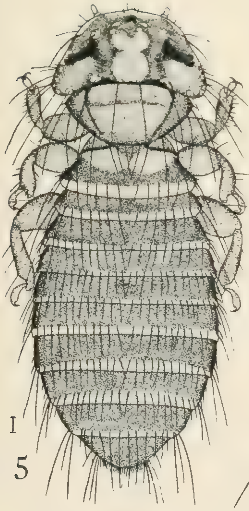
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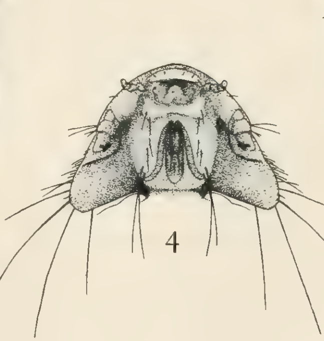
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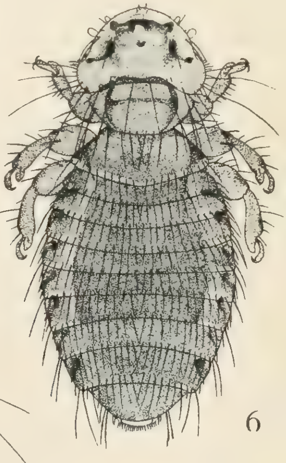
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V

NOTES ON FISHES,

Little Known or New to Science.

BY

DAVID STARR JORDAN,

President of the Leland Stanford Jr. University.

Leland Stanford Jr. University,
Palo Alto, California,
1896.

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(Reprint from the Proceedings of the California Academy of Science , Series 2, Vol. VI.)

LELAND STANFORD JR. UNIVERSITY,
PALO ALTO, CALIFORNIA,
1896.

PREFATORY NOTE.

This memoir is the fifth of a series designed to illustrate the investigations and explorations of the Hopkins Seaside Laboratory, an adjunct of the biological laboratories of the Leland Stanford Junior University. The series is issued under the patronage of Timothy Hopkins, Esq., of Menlo Park, California. The present paper is published with the co-operation of the California Academy of Sciences, appearing simultaneously in its present form and as part of the Proceedings of the Academy.

Charles H. Gilbert,
Oliver P. Jenkins,
Editors.

Date of publication, June 19, 1896.

NOTES ON FISHES, LITTLE KNOWN OR NEW TO SCIENCE.*

BY DAVID STARR JORDAN.

(With Plates xx-xliii.)

The present paper is made up of descriptions of new species of fishes, with notes on little known forms. The material examined, unless otherwise stated, is in the Museum of the Leland Stanford Jr. University, and most of the species referred to belong to the fauna of the Eastern Pacific.

In this paper the following new genera and species are mentioned for the first time:

Zaprora Jordan.
Zaprora silenus Jordan.
Salmo gairdneri crescentis Jordan & Beardslee.
Salmo gairdneri bairdsleei Jordan & Seale.
Umbrina sinaloæ Scofield.
Emmydrichthys vulcanus Jordan & Rutter.
Cottus annæ Jordan & Starks.
Cottus shasta Jordan & Starks.
Tarandichthys Jordan & Evermann.
Oligocottus borealis Jordan & Snyder.
Ulca Jordan & Evermann.
Eleotris abacurus Jordan & Gilbert.
Clevelandia rosæ Jordan & Evermann.
Bryssetæres Jordan & Evermann.
Arbaciosa Jordan & Evermann.
Rimicola Jordan & Evermann.
Starksia Jordan & Evermann.
Exerpes Jordan & Evermann.
Chasmodes jenkinsi Jordan & Evermann.
Sebastodes eigenmanni Cramer.
Sebastodes gilberti Cramer.

The accompanying plates are drawn by Miss Anna Louise Brown.

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*Contributions to Biology from the Hopkins Seaside Laboratory. No. 5.

Zaprora silenus Jordan.

Through the courtesy of Mr. Ashdown H. Green, President of the Natural History Society of Victoria, in British Columbia, and of Mr. John Fannin, Curator of the Provincial Museum of British Columbia, at Victoria, I have been allowed to examine the large fish to which I have given the name of *Zaprora silenus*. This specimen, twenty-nine inches in length, was taken in the harbor of Nanaimo, on Vancouver Island. It represents a new genus, allied to *Icosteus*, *Icichthys*, *Schedophilus*, *Acrotus* and *Centrolophus*, but in its combination of characters it is so different from all of these that I have been obliged to give it separate family rank. The definition of the family *Zaproridæ* may for the present be that of the single known genus, *Zaprora*.

Family ZAPRORIDÆ.

Zaprora Jordan, n. g.

Body robust, moderately compressed, the back not elevated, the belly not carinate. Body covered with small adherent cycloid scales, which cover the membranes of all the fins except the distal third, as also the gill membranes, lower jaw, cheeks, opercles and nuchal region. No lateral line; no spinules. Head short, the nape not elevated, the forehead broad and abruptly convex in profile; eye moderate, placed high; preopercle, parietal region, and region about eye with very large open mucous pores. No spines on head; edges of membrane bones of head covered with thick scaly skin. Mouth moderate, terminal, oblique, its cleft mainly anterior; upper jaw protractile, but not movable; maxillary rather narrow, simple; lower jaw very heavy, its thick tip projecting beyond upper jaw. Teeth alike in both jaws, rather strong, blunt, even, close-set, forming a uniform cutting edge; no teeth on vomer, palatines or tongue, the tongue very thick. Lower pharyngeals narrow, with bluntish teeth, those on the edge larger; upper pharyngeals rather large, with small, blunt velvety teeth; no distinct tooth-like processes in the œsophagus; pseudobranchiæ present; gill-rakers very slender and flexible, rather short; gills four, a large slit behind the fourth; gill membranes separate, free from the isthmus; opercle adnate to shoulder girdle above its angle; coracoids not largely developed. Pectoral fin long, rounded, attached a little nearer ventral than dorsal outline; ventrals wholly wanting. Dorsal fin beginning above gill opening, composed entirely of simple inarticulate rays or spines, these moderately flexible, attached to the membrane to their tips, and all except the first and last of about equal length. Caudal peduncle short and stout, not contracted, the large caudal subtruncate or rounded at tip, and without procurrent rays; vent nearly median. Anal much shorter than dorsal, somewhat higher, and composed of soft rays, subequal in length. Skeleton rather limp and flexible, but much less so than in *Icosteus*.

Type *Zaprora silenus*, n. sp.

This genus bears some resemblance to *Icichthys*, but differs in the stout caudal peduncle, absence of ventrals and lateral line, and in the form and structure of the head. Among the genera known to me it seems to come nearest to *Icichthys*, and it might be placed among the *Icosteidæ*, were it not for the presence of pharyngeal teeth. I therefore place it provisionally in a distinct family, *Zaproridæ*, having at present the characters of the single known genus.

1. **Zaprora silenus** Jordan, n. sp. Plate xx.

Head $5\frac{2}{5}$ in length to base of caudal; depth $4\frac{1}{8}$. D

LVI; A. 27; P. 20 to 22; C. 22; scales about 200–85. Greatest thickness of body about $\frac{2}{5}$ its depth; length of caudal peduncle $1\frac{2}{5}$ in its least depth, which is $1\frac{9}{10}$ in head. Eye $5\frac{1}{3}$ in head; snout $5\frac{1}{3}$; interorbital space 3; maxillary $2\frac{3}{4}$, ending under front of pupil; mandible $2\frac{1}{2}$, its depth $4\frac{2}{3}$; teeth about $\frac{45}{30}$ on each side; lips, snout, and bones about eye naked; rest of head covered with small scales. Lower jaw with a thick lip slightly fringed on its edge, and with a mesial frenum; the rounded tip entering the profile when the mouth is closed. Three large pores on each ramus of mandible; behind these three others in a line on horizontal limb of preopercle; three on vertical limb; two close together in front of eye; one near the nostrils, so similar to them that there seems to be three nasal openings; seven on suborbitals; four in two rows behind eye; one above eye, and before upper edge of preopercle; a horizontal row of five along temporal region, the last and largest of all in opercular flap above gill opening; one at vertex; one between vertex and eye and two on each side of nape. Gill-rakers 8+20, the longest half eye. No trace of lateral line. Scales small, resembling those of a salmon, covering the membranes of all the fins on the basal two-thirds. Pectoral as long as head, its base $2\frac{1}{3}$ in head; longest dorsal spine $1\frac{5}{6}$; caudal $1\frac{1}{10}$; longest anal ray $1\frac{2}{5}$. Color in spirits uniform dusky, without markings on the body, the belly pale, and the side of the head irregularly blotched with lemon yellow, apparently bright in life, and brightest about the pores of the head.

Length of type (in the Provincial Museum at Victoria, B. C.), 29 inches.

From Nanaimo, Vancouver Island. Collector, H. T. Stainton.

The type, in alcohol, has been partly skinned and stuffed, and its form has been somewhat distorted. The form it now has is shown in the plate. In life it may have been more symmetrical, the back higher and the body deeper.

The type specimen was sent to the Provincial Museum at Victoria by Mr. H. T. Stainton of Nanaimo, who gives the following account of it in a letter to Mr. Ashdown H. Green, under date of Nanaimo, January 25, 1896:

> "In reply to your favor of the 21st instant, which I have delayed answering in order to get the information you desire regarding the fish I sent to the museum. Mr. G. Marsh, a fish dealer, who gave me the fish, says it was caught on the 21st October, 1895, in the Straits of Georgia, a short distance north of Entrance Island Lighthouse [about three miles from Nanaimo—A. H. G.], by a fisherman named W. Crocker (who was fishing for codfish at the time), with a hand-line and hook baited with a piece of dogfish, in a depth of 150 feet of water. The inside, which was taken out by Mr. Marsh, was the same as that of the codfish *(Sebastodes)*, and contained what appeared to be a jelly fish. When Mr. Marsh got the fish from the fisherman, it might be said to be still alive, and at that time the holes in its head were more distinct and the coloring around them of a deeper and richer lemon color than when it was packed for shipment to the museum."

Family NEMICHTHYIDÆ.

2. **Nemichthys avocetta** Jordan & Gilbert. Plate xxi.

Jordan & Gilbert, Proc. U. S. Nat. Mus., 1880, 409. Port Gamble Wash.

In the same collection of the Provincial Museum at Victoria is a fine specimen of *Nemichthys avocetta*, the second specimen known. This was taken on the beach at Beacon Hill, near Victoria, by Mr. Norgate, in 1894, and sent to me for examination by Mr. Fannin. This agrees with the description of the original type, the slight differences separating that from *Nemichthys scolopaceus* of the Atlantic being constant. A generic character of *Nemichthys* not heretofore noticed is the division of the dorsal rays into two sorts, near the middle of the body, the anterior series being much longer than the others, and all being undivided or spine-like. This character is shown in the accompanying plates, taken from the Nanaimo specimen. This character does not exist in the related genus *Avocettina*.

3. **Avocettina gillii** (Bean). Plate xxi.

Labichthys gillii Bean, Proc. U. S. Nat. Mus., 1890, 45. Prince of Wales Island, Alaska.

For purposes of comparison, I present a figure of *Avocettina gillii*, from a specimen (No. 679, L. S. Jr. Univ.) taken by the Albatross at Station 2860. The genus *Avocettina* differs from *Labichthys* and *Nemichthys* in the backward position of the vent, and there is no division in the dorsal rays like that seen in *Nemichthys*.

THE TROUT OF LAKE CRESCENT, WASHINGTON.

Some months since Rear Admiral L. A. Beardslee, U. S. N., called my attention to the splendid trout found in Lake Crescent, a mountain lake in the Olympic Range, above Port Angeles, Washington. These trout, according to his view, were of two species, one or both of them new to science. These are locally known as the "Blue-back" and the "Speckled" trout.

Recently, through the kindness of Mr. M. J. Carrigan of Port Angeles, and Mr. George E. Mitchell of Fairholme, one specimen of the speckled trout and two of the blue-back have been sent to me for examination. I find myself forced to agree with Admiral Beardslee in the opinion that each of these forms is distinct from any previously recorded or named. The two are allied to each other, rather than to any other form, and the nearest affinities of both seem to be with the steelhead trout (*Salmo gairdneri*) rather than any other. But placing the two as subspecies of *Salmo gairdneri* is simply a provisional arrangement, and there is just as good warrant for regarding each as a distinct species.

From all forms of *Salmo gairdneri* both the new forms differ in the large size of the head as well as in coloration and in the form of the snout and opercles. The size of scales, the form of the gill-rakers, the form of the opercle, the form of the pyloric cœca, the outline of the caudal, and the coloration, are different in the two forms.

4. **Salmo gairdneri crescentis** Jordan & Beardslee, n. subsp. SPECKLED TROUT OF LAKE CRESCENT. Plate xxii.

Head $3\frac{4}{5}$ in length to base of caudal; depth 5; exposed portion of eye 6 in head, $1\frac{2}{3}$ in snout; scales 32–151–34, 151 cross-series, 83 in front of dorsal; dorsal with 10 branched rays, anal with 11; branchiostegals 10; gill-rakers 6+11, counting rudiments, these very short and thick, the longest but $\frac{3}{16}$ inches in length, $18\frac{1}{2}$ in maxillary; mouth large, maxillary extending much beyond eye, $1\frac{2}{3}$ in head, with about 20 teeth; tongue with the usual teeth; teeth on vomer in zigzag series; hyoid region of tongue without teeth. Snout $3\frac{1}{2}$ in head; preorbital very narrow, not so wide as maxillary adjacent to it; the posterior suborbitals longer than eye, $5\frac{1}{3}$ in head; opercle and subopercle very narrow, scarcely as wide as eye, the free part of opercle $6\frac{1}{3}$ in head; interorbital width $4\frac{1}{4}$ in head. Origin of dorsal in middle of length of body, its margin straight, anterior $2\frac{1}{2}$ times posterior, and slightly longer than base, $2\frac{1}{3}$ in head. Last ray of dorsal pointed. Origin of anal midway between origin of dorsal and base of caudal, margin irregular, anterior rays three times length of posterior, and equal to base of fin, $2\frac{2}{5}$ in head. Adipose fin high and slender, situated immediately behind anal. Pectoral $1\frac{4}{5}$ in head. Ventrals under middle of dorsal, $2\frac{3}{5}$ in head. Caudal broad, slightly emarginate, nearly truncate when spread, its corners not rounded, its longest rays $1\frac{1}{2}$ in head. Least depth of caudal peduncle $3\frac{3}{5}$ in head. Pyloric cœca about 51, the longest about $1\frac{5}{6}$ in head, and very slender. Color in alcohol very dark steel blue above, becoming paler below, nearly white anteriorly on belly where only the margins of the scales are punctate; no silvery anywhere; lower jaw dusky, a large black blotch on cheek between suborbital and premaxillary. Sides, back, top of head, dorsal and caudal fins with few small dark spots; pectorals dusky, slightly spotted at base; anal slightly dusky, without spots; ventrals dusky with a few spots in middle; adipose fin with a few spots; lower fins all tipped with pale, probably yellowish red in life. Spots all very small and faint, not confined to posterior part of body.

The specimen before us, No. 1863, L. S. Jr. Univ., is a male, $18\frac{1}{4}$ inches long. It was taken at Fairholme on Lake Crescent, Clallam county, Washington, March 12, 1896, by Mrs. G. E. Mitchell of Fairholme.

The following account of Lake Crescent is given by Mr. M. J. Carrigan:

"Lake Crescent, from which the blue-backs are taken, is about twenty miles from Port Angeles, and is a most beautiful and prolific body of water. It is in the Olympic Mountains, is seven hundred feet above the level of the sea, and in size is about ten miles long by two miles wide. It is very deep, many hundreds of feet in places, and its waters are very cold. Its water supply comes in large part from the snow from the mountains which rise from its shores in great majesty and almost completely surround it. The fishing there is really magnificent, especially fly-fishing. Several varieties of trout abound, but the blue-back is the handsomest and gamest fish in the lake. They afford one great sport. Those that the Admiral took measured from twenty-eight to thirty-two inches in length, and averaged about ten pounds each in weight. He has doubtless furnished you with exact data regarding his fine catch there."

5. **Salmo gairdneri beardsleei** Jordan & Seale, n. subsp.
BLUE-BACK TROUT OF LAKE CRESCENT. Plate xxiii.

Head $3\frac{4}{5}$ in length to base of caudal; depth about 4; eye $4\frac{5}{6}$ in head, $1\frac{2}{5}$ in snout; scales 24–130–20, 130 cross series, those in front of dorsal numerous, about seventy if counted along median line, sixty if the rows along upper side are counted; dorsal with 10 branched rays; anal with 11 branched rays; branchiostegals 11; gill-rakers $8+13$, rather long and slender, the longest nearly $\frac{5}{16}$ inch in length, 7 to 9 in maxillary. Head pointed; mouth rather large; maxillary extending to hinder margin of eye, $1\frac{4}{5}$ in head, with about 20 teeth; snout $3\frac{3}{5}$ in head; preorbital very narrow, the maxillary almost touching the orbit; posterior suborbitals shorter than eye, about 6 in head; opercle not very broad, equal to eye, its free part $4\frac{5}{6}$ in head; interorbital width $3\frac{3}{5}$ in head, equal to snout; several large teeth along margin of tongue; no hyoid teeth; teeth on vomer in zigzag series. Origin of dorsal in middle of the length, margin slightly concave, the first ray $1\frac{5}{6}$ times last, the last ray being pointed, slightly greater than base, $2\frac{1}{10}$ in head. Origin of anal midway between origin of dorsal and base of caudal, margin straight, the tip of the last ray slightly exserted; anterior rays 3¼ times posterior, and equal to base of fin, 2⅓ in head. Adipose fin high and slender, situated above or anterior to end of anal. Pectorals 1½ in head; ventrals under middle of dorsal, 2⅓ in head. Caudal broad, nearly truncate, the middle portions abruptly lunate when spread open, with pointed angles, each lobe being somewhat convex on its edge; longest rays 1⅓ in head. Least depth of caudal peduncle 2¾ in head. Pyloric cœca 50 to 60, short and thick, the longest about 3 in head. Color in spirits very dark blue above, sides abruptly brighter, with many scales abruptly silvery; below white, lower jaw white, its margin dusky; cheeks below suborbitals very dark; sides, top of head, dorsal and caudal fins spotted, the spots all very small; pectorals and ventrals nearly colorless, without spots, and slightly dusky; adipose fin with two spots; tips of lower fins faintly tinged with yellowish.

Two specimens, each 16 inches long, Nos. 1861 and 1862, L. S. Jr. Univ. They were taken on March 12 and 16, 1896, in Lake Crescent, by Mrs. George E. Mitchell of Fairholme, and sent to us by Mr. M. J. Carrigan of Port Angeles. No. 1864, L. S. Jr. Univ.

A third specimen of much larger size, afterwards sent to us, shows the following characters:

Head 3⅚; depth 3⅔; D. 12; A. 12 branched rays; branchiostegals 11 or 12; scales 23–123–26, 64 before dorsal; snout 2⅚; eye 7⅔; maxillary 1⅔ in head, its depth 8 in its length.

Body robust, little compressed; head large, maxillary moderate, extending beyond eye; opercle moderate, its width 5⅔ in head. Last ray of dorsal pointed. Caudal subtruncate, lunate mesially, each lobe somewhat convex, pointed at tip. Caudal peduncle short and thick. Series of vomerine teeth long, in double row. Color above dark green, with black spots which are small and sparse on body, extending to below lateral line; many small spots on head, dorsal and caudal; spots not more numerous behind than before; sides and belly bright silvery; no red on lower jaw; a faint pink shade along lateral line; pectorals colorless except the upper ray; ventrals and anal colorless; flesh pale; gill-rakers removed.

This specimen, male, was taken in Lake Crescent. Length 26½ inches; weight in life 14 pounds.

This specimen differs from a large *gairdneri* most in the large scales. In addition the head is much larger, and the body deeper.

A fourth still larger specimen (No. 1865, L. S. Jr. Univ.), an old spent male, 27 inches long, has been still later received. It shows the following characters:

D. 11; A. 12. Head $3\frac{3}{5}$ in length. Gill-rakers 8+12, of medium size, rather broad but sharp pointed; opercle 3½ in head; eye 7 in head; B. 11. Maxillary long, reaching beyond the eye, 1⅔ in head, its width 9½ in length. A double row of sharp teeth extending to within a short distance of end, where they are replaced by a single row of slightly larger teeth; teeth on tongue rather large; no teeth on hyoid; teeth on vomer in zigzag series. Scales 26–137.

This specimen, a spent male, has the flabby muscles and slimy half concealed scales of the spent male salmon. The dark dots are very numerous and small and show very distinctly on back and sides, as also on head and fins. There is a dull red lateral band on head and body. This is about an inch broad, its outlines diffuse: A black blotch on cheek; maxillary dusky with a red blotch toward its tip. Lower jaw and branchiostegals dusky; pectoral, ventral and anal dark; back dark green, belly dusky.

The following account of the life-coloration of *Salmo beardsleei* is given by Mr. George E. Mitchell.

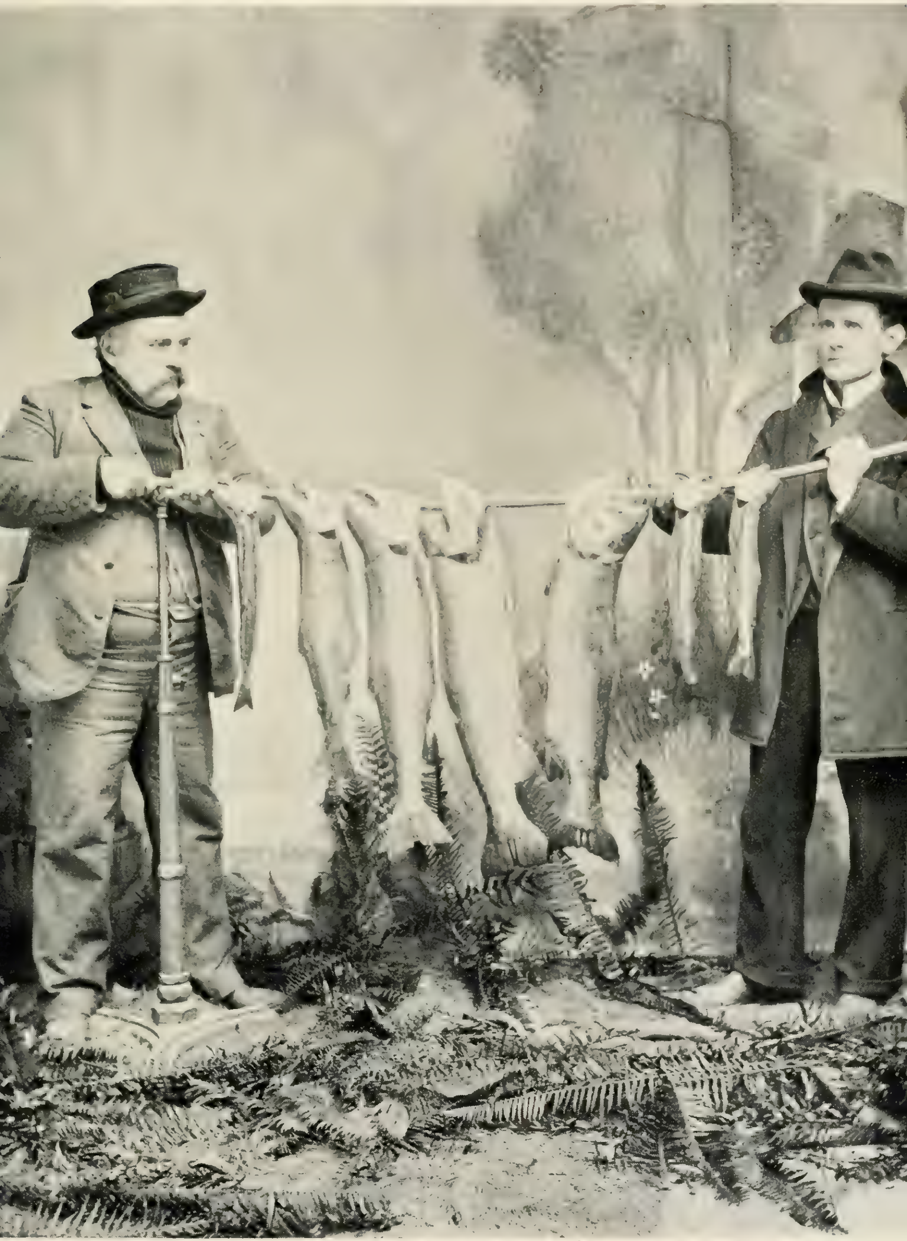
"The Blue-back Trout caught in Lake Crescent are on the back a deep dark-blue ultra-marine color of a peculiar transparency, dotted with small round black spots from the size of a pin's head to a little larger. The two fins on the top of the back are a dark smoky color, also dotted as on back end and are transparent. The tail is the color and transparency with dots also—same as the top fins. The side fins and the bottom fins are dead white and sometimes faintly tinged with a pinkish hue at the edges; the belly is white. Looking at the fish sideways the sides of the fish show the scales to be iridescent, the red flash predominating. The head has very much the polish of mother-of-pearl around the lower jaws and jowls, red and pale blue colors predominating; under the eyes a few black spots; on top of head the blue much darker than on top of back—so dark in fact that the black spots on it look blacker than the rest. The nearer the shore these fish are caught the lighter the blue on back, the fish often having an impression of the surroundings distinctly marked on them."

The following notes are added by Admiral Beardslee:

HABITS.

The Blueback is a deep water dweller; those taken by me in late October were caught at depths varying from 30 to 50 feet, on large spoons. They fought hard until brought near surface, then gave up, and when landed were found puffed up with air. Specimens taken in spring and put in pools in mountain streams with other trout died very soon, while the others lived. The trout caught by Mr. Mitchell, in March, was taken near bottom, by a large spoon, and it is not on record that at so early a date one has previously been caught.

Bluebacks from Lake Crescent, Washington.


L. A. BEARDSLEE.
6
11½
11
11½
M. J. CARRIGAN.

TWO HOURS' WORK, OCTOBER 28, 1895.

FLESH.

Light lemon color before cooking; devoid of the oily salmon flavor, and very excellent; whitening by cooking.

OVA.

October 28—The eggs in the large fish were in *individual* size, and in size of cluster much smaller than those of a salmon of the same size.

The following extracts from a letter from Mr. Carrigan, dated Port Angeles, April 30th, are of much interest:

* * * Answering your direct inquiries: The Beardslees and Crescents are readily distinguishable, and can always be told apart.

There are no red spots at the points indicated on the Crescent trout—no markings to suggest the Cut-throat trout.

There are no Cut-throat trout in Lake Crescent.

The Beardslees (Bluebacks) are taken in deep water. Those caught by the Admiral and myself were taken in from 25 to 35 feet of water.

The known varieties of trout in the lake are:

(a) "Beardslees."

(b) "Crescents."

(c) "Silvers" (the local name for a very beautiful trout, that measure, as a rule, from 12 to 18 inches in length; but I have seen specimens 22 inches long, and there are doubtless much longer ones in the lake).

(d) "Half-breeds" (the local name for a long, slender, graceful trout, that seems to be a cross between the Beardslees and Crescents. The markings of the fish, as I recall them after last season's fishing, are a rather pale olive-green back and silver sides; the head and back being dotted with rather faint small black spots. The shape of the fish is one of its distinctive features. The flesh is pale lemon colored).

(e) "Mountain trout" (a variety that evidently comes into the lake from the mountain streams that empty into it).

The possibilities of the beautiful mountain lake have never been fully tested. The Admiral (Beardslee), when he comes up in June, will fish it at all depths, and there is no telling what new surprises he may bring forth. The lake is about 10 miles long by 2 or 2½ miles wide, and deep water is found everywhere close to shore. In places a 500 foot lead-line will not sound bottom. No one really knows what depths of water exists in the lake beneath the 500 foot sounding, or what size or variety of trout can be taken at depths lower than those so successfully tried by Admiral Beardslee. But we will know this season; and you will be promptly acquainted with everything new or of interest that is brought forth.

* * * High up on the side of one of the mountains surrounding the lake—probably 2,500 or 3,000 feet above the lake—is a pretty little lake containing what I believe will also prove a new variety of trout. Specimens of the variety are found every spring, after the freshets caused in the mountain streams by melting snow, floating on the surface of Lake Crescent, dead. They are evidently carried out of the little lake by the torrent and are battered to death in going over the falls in the creek, for streams empty into the little lake that have their origin up near the crest of the mountain. Mrs. Carrigan found one of these trout floating on Lake Crescent about ten days ago. It was still alive, but died directly after being taken into the boat. Its head and body were all bruised and battered, and its tail fin was broken and in shreds. It may be that the little lake is the home for what we, for want of a better name, call Half-breeds. We will go up to the little lake this summer, and secure some good specimens of the trout it contains. * * *

In a letter to Admiral Beardslee, dated April 19th, Mr. Carrigan gives these further details, especially interesting to the angler:

* * * I have some news that will interest you. We have a young lady friend visiting us—Miss Sara Beazley of Columbia, Missouri. On Friday, the 17th inst., Mrs. Carrigan and Miss Beazley drove out to Lake Crescent to spend a few days with Mrs. Mitchell. They returned in triumph at 4 o'clock this afternoon, with four trout weighing 21 pounds.

Miss Beazley, Mrs. Mitchell and Mrs. Carrigan went out fishing at 10:30 yesterday, Saturday morning, April 18th. They took the copper wire troll that you sent to Mrs. Mitchell and Miss Beazley did the fishing, using trout belly for bait. When off Eagle Point, at 11:30, Miss Beazley caught and successfully landed a magnificent speckled trout that measured 27 inches in length, was 6 inches through, and weighed 8 pounds. The top of the head and back of the fish is a dark blackish green, the head and back being thickly covered with quite large round black spots which extend down the sides about halfway to the median line. From there to the median line the black spots are equally thick, but are irregular in form, two and sometimes three spots lapping on to each other, making angular looking black spots of various sizes, some of them quite large. The irregular spots extend in a scattering way below the median line. The tail is thickly marked with round black spots.

The upper jaws and gill plates have the appearance of clouded reddish mother-of-pearl, somewhat iridescent. In some lights the "reddish" shade has a burnished copper effect, and in other lights it presents a pale magenta shade. There are six large round black spots on each side of the head, on the upper and back portion of these mother-of-pearl plates (on a line back of the eyes). The back fins are blackish green, heavily dotted with round black spots. The side and belly fins are of smoky gray, opaque, and entirely free of spots.

Miss Beazley had a great struggle landing the fish. It made a fine fight, towing the boat for a long distance. She landed him without a gaff-hook.

About an hour later in the same locality Miss Beazley caught a one-pound Bearsdslee. The party then went home to luncheon, and at 4:30 started out again, Miss Beazley still managing the troll, and Mrs. Mitchell managing the boat. At 6:30 o'clock, when off Eagle Point, Miss Beazley caught and landed (without a gaff, also) a superb Beardslee that measured 29½ inches in length and 8 inches through, and weighed strong 10 pounds. It was a beautiful specimen and made a fierce and prolonged fight. It raced along with the boat (the wind slight favoring its "tow") for a long distance below the point, and made several desperate and out-of-the-water leaps and plunges to get away; but it had swallowed the hook and was securely caught. As soon as it struck the bottom of the boat, on being taken over the side, it began a terrific struggle to get back into the water, and both Miss Beazley and Mrs. Mitchell had to throw themselves upon him and hold him down with their knees. When he was finally killed and the hook removed, it was found that in his struggle for freedom he had badly bent the shank between the spoon and the hooks; but it held fast, to the delight of the three ladies, who made the lake ring with their exultant exclamations. I don't suppose there ever were three happier women.

On their way home, Miss Beazley landed a beautiful two-pound Crescent.

Both of the big trout were caught just as the wind freshened into a strong breeze, and were taken in from 30 to 35 feet of water. The women followed the plan of rowing along slowly; stopping rowing altogether for a few seconds, and then starting off again slowly. Both fish were taken just as the boat started up, after one of three brief stops, during which the troll had gone down to a greater depth than when the boat was in motion.

I examined the Beardslees with great care just after the women reached home this afternoon, and have settled these points definitely: The head is densely spotted with round black spots down as far as the mother-of-pearl gill plates, but no further. There are no black spots on these plates. The blue on the back extends down almost to the median line, and the entire back, from head to tail, and on either side halfway down to the median line, is thickly marked with round black spots which decrease in size as the tail is approached. The tail itself is densely dotted with round black spots, as are also the back fins. The side and belly fins are not spotted. The black spots on the back are not so prominent as on the smooth surface of the head, owing to the presence of the scales on the back and sides, but they are there in great numbers.

I noticed this difference between the marking of the one-pound and the ten-pound Beardslee. On the one-pound fish there is a well-defined line of large round dark spots extending the whole length of the body, from a point just back of the gills to the tail fin, and midway between the median line and the bottom of the belly. There are 17 of those spots grading down in size. These spots are not a pronounced black, but show out plainly enough from beneath the whitish silver scales, presenting the dark dull appearance of human flesh bruised by a blow. These spots are entirely absent from the ten-pound Beardslee.

* * * On Friday, April 17th, just before Mrs. Carrigan and Miss Beazley arrived at the lake (it was about 6 o'clock in the afternoon) Mrs. Mitchell caught, with the gear you sent her, a twelve-pound Beardslee, measuring 30 inches in length and 8½ inches through. She is immensely proud of your gift, which is doing such splendid work so early in the season.

These fine catches made by the ladies prove the possibilities of the lake in early spring; your own splendid success demonstrates what can be done late in the fall, at the very tail end of the season. It remains for you to show what can be done in the heat of the season. There is no knowing what surprises may result from the deep fishing that you will do this summer, for I know that you will give the lake a thorough test at all depths.

It would be a good idea to take out, when you go there this summer, a proper rig for sounding the lake, which has never yet been sounded.

It is my conviction that you will shatter your own big trout record all to pieces this summer, and give the fishing world a series of fresh surprises.

* * * The Eagle Point stream has its origin in a little lake high up on the mountain side, probably 2,000 feet above Lake Crescent. There is a high and very pretty water-fall in the stream. On the mountain side of the little lake are trout, and the fish the ladies picked up on Crescent Lake evidently came from this little lake, being battered to death in coming over the fall. The men who run the launch say that the spring freshets bring down large numbers of trout from this little lake, and that many of them are killed in the descent.

In a letter to me, dated May 5, 1896, Mr. Carrigan gives further notes of interest concerning the third specimen described above:

I have just forwarded to you a 14-pound "*Crescent Lake trout*" (the Blueback), which was caught at Lake Crescent, Sunday afternoon, by Mr. Ben. Lewis. This trout, when taken from the water, weighed full 14 pounds, measured 32 inches in length and 8½ inches in width. Mr. Lewis at once started for Port Angeles, to present the trout to me to be forwarded to you, for I had told him that I was anxious to send you a large specimen of the Crescent trout, that you might note its special characteristics. He rowed over the lake, 8 miles, and walked into Angeles, 20 miles more, carrying this trout on his back, arriving here at midnight. We were both desirous of getting the fish off to you as promptly as possible and in the best condition, but it was impossible to get any ice here yesterday, and we had to keep the trout as best we could until the ice we telegraphed for arrived from Seattle to-day.

It is a magnificent specimen of the "*Salmo beardsleei*," and certainly presented a splendid appearance when first unrolled from Mr. Lewis' pack-sack. It was then sweet, fresh and plump. I hope it will reach you in good condition. We packed it carefully in ice before sending it forward.

It is a pity that we cannot get one of these fish to you, showing its beautiful life coloring. When freshly taken from the water the head and back of the trout is a very deep, rich blue, which extends well down to the median line, and below the median line all is gleaming, creamy white, with a sheen as bright as burnished silver, and iridescent. The head, back and tail are strongly marked with black spots.

The beautiful blue coloring of the back fades out after death and loss of blood, and changes to a shade of silvery green. I don't know what the fish look like when they reach you, but they have lost their royal coloring before they leave here.

Mr. Lewis has just told me of an entirely new variety of trout that he catches in the lake, at a depth of from 80 to 100 feet. He takes them on set lines, which he places out over night, and says he has never been able to catch one of this species in any other way. He says it differs from any other trout in the lake; that it is a long, slender, graceful and very attractive fish, with a grayish green back and below the median line, pure white sides and belly. He has promised to secure a specimen of this variety for me to be sent to you.

Family LUTIANIDÆ.

6. **Xenocys jessiæ** Jordan & Bollman. Plate xxiv.

Xenocys jessiæ Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 160. Charles Island, Galapagos.

The figure of this handsome species is taken from one of the original types.

Family SCIÆNIDÆ.

7. **Umbrina sinaloæ** Scofield, n. sp. Plate xxv.

Head 3$\frac{9}{10}$; depth 3$\frac{6}{10}$; eye 3¾ in head; snout 3⅓; interorbital space 4¼; tip of snout to end of maxillary 2½; D. X–I, 28; A. II, 6; scales 7–51–10; (scales 7 between front of dorsal and lateral line, 10 between line and vent; 51 pores in lateral line to base of caudal); pectorals 1$\frac{3}{5}$ in head; ventral 1$\frac{2}{5}$; second anal spine 2¼; third dorsal spine longest, 1⅔ in head; gill-rakers 6+9, rather slender, about ½ as long as pupil; distance to anal 1½ in length (1⅓ in *xanti*); barbel slender; caudal slightly lunate, the upper lobe the longer. Color dark above (greenish in life), silvery below; a dark blotch on opercle; conspicuous dark olive stripes follow the center of the scale rows upward and backward on the sides and back; stripes about ½ as wide as pupil; spinous dorsal dusky; ventrals and anal pale, without punctulations; lining of gill cavity quite dark; gill membranes pale; peritoneum pale.

Resembles *Umbrina xanti* very closely; but is distinguished by the dark gill cavity, the small scales, small second anal spine, and more anterior position of anal. The stripes on the body are slightly darker, not so undulating, and there are a few more of them, due to the smaller and more regular scales.

Length 8 inches.

Type No. 1632, L. S. Jr. Univ. Mus., collected at Mazatlan by the Hopkins expedition of 1894. Several specimens were obtained in company with *Umbrina xanti*. It is equally abundant, having been hitherto confounded with the latter species. I may note that specimens of the Californian species, *Umbrina roncador*, are in the collection from Guaymas.

Family SCORPÆNIDÆ.

8. **Emmydrichthys vulcanus** Jordan & Rutter, n. gen. and sp. Plate xxvi.

Generic description:

Body short and stout, length of head about equal to depth; body with no scales, thickly covered with irregular dermal prominences. Cleft of mouth vertical. A band of minute depressible teeth in each jaw, none on vomer or palatines. Tongue free, short and broad. Opercles unarmed, covered with thick loose skin. Gill openings very long. Eyes with an almost vertical range, the interorbital space very deep, a large pit behind and one below each eye. Dorsal divided by a deep notch, the anterior part with nine, the posterior with two spines; anal with three. Anterior spines of dorsal each with a pair of antero-lateral grooves.

The new genus *Emmydrichthys* is closely related to *Synanceia* Bloch, differing in having the dorsal divided and with a smaller number of spines, and in the presence of a deep pit or groove below eyes.

Head 2⅓ in length, depth 2⅓. D. IX–II, 7; A. III, 6; P. 18. Gill opening extending forward almost to below mouth, almost as long as depth of body. Head with many pits and irregular protuberances. Eyes situated on the outer sides of a pair of protuberances, the interorbital space very deep and nearly smooth, a large cavity behind each eye and a smaller one below. A small papilla on upper side of eyeball. Jaws equal, fringed with cirri. Anterior nostril tubular. Dorsal fins connected at base. Fin membranes all thick and heavily papillose, greatly thickened around anterior dorsal spines. Eyes midway between snout and origin of dorsal. Middle dorsal spines slightly longest, about equal to distance of first spine from pupil; longest pectoral rays, third and fourth from top, equal to distance of dorsal from tip of lower jaw; anal not so high as soft dorsal; caudal small, rounded, shorter than ventrals; ventrals with two-thirds of inner side grown to body. Color, in alcohol, nearly entirely jet black, the tips of the warty processes on head washed with white, and some minute whitish streaks on under edge of eye.

This specimen, in color and appearance, bears an astonishing resemblance to a lump of black lava.* This is undoubtedly a matter of mimicry, and its native haunt must be among volcanic rocks.

The type specimen, 9½ inches long, was sent to the museum of California College, Oakland, by Rev. J. H. Henry of Tahiti. It was said to have been taken at the Hawaiian Islands. By the courtesy of Professor Inskeep of this institution we have been permitted to examine this type. The species is called by the natives No-ho, and its poisonous dorsal spines cause it to be greatly dreaded.

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* Hence the name from *μύδρος*, a lump of lava.

Family COTTIDÆ.

9. **Cottus annæ** Jordan & Starks, n. sp. Plate xxvii.

Head 3½ to 3¾ in body, depth 5. D. VII or VIII–16 or 17; A. 12; eye 5 in head; maxillary 3⅔; highest dorsal spine 3½; highest soft ray 2; pectoral 1; ventral 1⅗; caudal 1¼.

Body elongate, not much compressed; caudal peduncle wide, wider than length of snout. Head small, broadly rounded anteriorly as viewed from above; snout blunt as viewed from the side; mouth very small, without so much lateral cleft as in *Cottus beldingi* or *C. philonips*, the maxillary reaching to front of pupil; teeth in moderately wide bands on jaws and vomer; palatines toothless or with a few teeth in a narrow band on front; interorbital (bone only) equals ½ eye; eye smaller than length of snout; preopercle with only one small blunt spine, below which its edge is entire. Pectoral barely reaching front of anal; spinous dorsal very low, from ½ to ⅔ as high as soft dorsal, its base from its first spine to first ray of soft dorsal 1¼ in head; dorsals barely meeting, not at all connected.

Color light gray, somewhat mottled; ventrals and anal colorless, other fins crossed with wavy lines; a black spot on each end of spinous dorsal.

We have compared these specimens with specimens of *Cottus beldingi* from Birch Creek, Idaho, and from other localities as also with a single type specimen of *Cottus* *philonips* from Field, B. C. It differs from both of these in having the mouth and eyes smaller, and from the Field specimen in having a deeper body.

Here described from four specimens from 2½ to 3½ inches in length, collected at Gypsum, Colorado, from the Eagle River, by Jordan, Evermann, Fesler and Davis, Nos. 1305, 1308, 1309 and 1310, L. S. Jr. Univ. Mus. It has hitherto been confounded with *Cottus semiscaber*, which was taken in abundance at the same place, and recorded in their report as "*Cottus bairdii punctulatus.*" The species is named for Miss Anna Louise Brown, artist of the Hopkins Laboratory.

We may here note that *Cottus philonips* is very doubtfully distinct from *Cottus beldingi*, the only difference we can find being in the deeper body of the latter, which is a widely distributed species. Of *Cottus philonips* only the types are yet known, the Alaskan specimens referred to it being quite distinct.

10. **Cottus shasta** Jordan & Starks, n. sp.

Head 3 to 3⅓ in body, depth 4½. D. VIII or IX–17 or 18; A. 13 to 15; eye nearly 5 in head; maxillary $2\frac{1}{5}$; third or fourth dorsal spine $3\frac{3}{5}$; highest soft ray about 2; pectoral about $1\frac{1}{10}$; caudal 1¼.

Body not much compressed; caudal peduncle rather wide, about equal to snout; mouth rather large, the maxillary reaching to posterior margin of pupil; teeth in a moderate band on jaws and vomer, in an exceedingly narrow band in front of palatines; interorbital space not much over half eye; upper preopercular spine short, not much hooked up and not very sharp; a shallow concave space between it and the second, scarcely a notch; the second small and sharp, the third but slightly developed. Pectoral reaching to below the fourth ray of soft dorsal; ventrals not reaching the vent; dorsals scarcely con nected, the soft dorsal high, the highest rays equal to eye and snout; vent slightly nearer tail than tip of snout. Skin smooth, except a few scattered prickles under pectorals.

Color very dark brown or blackish; sides mottled; top of head uniform blackish; all the fins more or less mottled, ventrals white or dusky. The following is the fin formula of four specimens:

Dorsal IX–17; VIII–19; IX–17; IX–18.
Anal 14; 15; 15; 13.

Upper Sacramento Basin; here described from four specimens from McCloud River, Baird, Shasta county, California, about 4 inches in length. No. 4196, L. S. Jr. Univ. Mus. Collector, E. C. Starks.

The species is very close to *Cottus semiscaber*, but it has a longer anal.

11. **Tarandichthys filamentosus** (Gilbert). Plate xxviii.

Icelinus filamentosus Gilbert, Proc. U. S. Nat. Mus., 1890, 85. Off Santa Barbara Islands.

The section of *Icelinus* distinguished by the presence of filamentous dorsal spines, and the presence of bony plates behind the pectoral, represents a subgenus or genus distinct from *Icelinus*. This may be called *Tarandichthys*, Jordan & Evermann. The name (*Ταράνδος*, reindeer) alludes to the antler-like preopercular spine. The accompanying plate is from one of the type specimens of the type-species, *filamentosus*.

12. **Icelinus quadriseriatus** (Lockington). Plate xxix.

We present for comparison a figure of the type-species of *Icelinus* from a specimen dredged off the coast of California.

13. **Oligocottus borealis** Jordan & Snyder, n. sp.

Head $3\frac{1}{5}$ in length; depth $4\frac{1}{3}$; dorsal VIII or IX–16 or 17; anal 12 to 14; pectoral 14; orbit 4 in head; snout 4; maxillary $2\frac{4}{5}$; highest dorsal spine 3; dorsal ray $2\frac{1}{5}$; caudal ray 1½; first anal ray ♀ 1½, ♂ 3; ventrals $1\frac{5}{6}$; caudal peduncle 3½; pectorals 3 in length.

Body compressed, elongate; back somewhat elevated, deepest below middle of spinous dorsal. Head almost as wide as long, tapering from behind to the somewhat pointed snout; profile of head rounded above, straight below; mouth terminal, nearly horizontal; maxillary extending to vertical through posterior part of pupil; lower jaw included; jaws, vomer and palatines with villiform teeth; snout as long as orbit; eye high in head; interorbital space narrower than width of orbit; its concavity angular; opercle with a triangular flap; angle of preopercle produced into a forked spine, which is covered with skin, except on the sharp points; prongs of preopercular spine half as long as orbit; nasal spines prominent; the long premaxillary processes form a sharp ridge between the latter; branchiostegal membranes forming a fold across the isthmus; gills 3½, the slit behind the fourth arch much reduced; pseudobranchiæ present; gill-rakers represented by a few protubrances on the arch.

Skin smooth. Filaments on free end of maxillary, on inferior edge of preopercle, and from first dorsal to the bases of the pectoral fins; also a row of filaments extending along the supraorbital crest, over the back of the head and along the lateral line for about half the length of the body; the filaments are usually paired, *i. e.*, two grow from the same place. Anal papilla prominent. Large mucous pores are scattered about the top and sides of head; pores of lateral line 36 to 40.

Dorsal fins two, separate; first dorsal 4 in head and body, curving from distal end of first spine to posterior part of base; spines rather feeble; second dorsal 2 in head and body, a little higher than first, its middle rays longest. Anal fin about 3¼ in head and body; in the male the first and second rays longest, the third, fourth and fifth each a little shorter than the preceding one, the last shortest. In the female the first ray is the shortest. Caudal fin somewhat rounded. The pectoral rays below the sixth are ventrally free from the connecting membrane for a portion of their length. Ventral fins reaching to vent, in some specimens to anal.

Color usually reddish brown, varying to gray, intense green or crimson, according to surroundings, the colors developed in the presence of similarly colored algæ; dorsals, pectorals and caudal barred; anal sometimes barred; front of spinous dorsal with an ocellated black spot.

The types were collected in the tide pools at Neah Bay, Puget Sound, by Mr. E. C. Starks. Very many specimens are in the Leland Stanford Jr. University collection, No. 3396. Others were earlier sent to us by Henry St. Clair of Neah Bay. Still others were taken by Dr. Gilbert at Departure Bay, Vancouver Island.

This species is closely related to *Oligocottus maculosus*, with which it has been hitherto confounded. It is distinguished from the latter by having fewer filaments on the head and body, an ocellated spot on front of first dorsal, and by having the rays of the anal fin in the male all connected by membrane; the first ray of anal is much shorter and weaker in *borealis*.

14. **Ulca marmorata** (Bean). Plate xxx.

Hemitrepterus marmoratus Bean, Proc. U. S. Nat. Mus., 1890, 43. Sitkalidak Island.

This species differs from *Hemitripterus* in the shorter first dorsal, which does not show the division found in the typical species of *Hemitripterus*. It is the type of the genus, *Ulca*, Jordan & Evermann. The specimen figured, not a type, is from near Unalaska. Coll., C. H. Gilbert, on the Albatross.

Family GOBIIDÆ.

15. **Eleotris abacurus** Jordan & Gilbert, n. sp.

Head 3; depth 4⅓. D. VI–9; A. I, 8; scales 51–20; eye 8 in head, 2⅓ in interorbital width; pectoral 1⅓; ventral 1½; highest dorsal ray 2; highest anal ray 2; caudal 1¼.

Body slender, compressed, the head depressed, becoming very narrow anteriorly, its width ⅗ its length; a notable depression above orbits, the premaxillary processes protruding before it; lower jaw the longer; maxillary reaching vertical behind pupil, 2⅗ in head. Teeth in jaws in narrow villiform bands, becoming a single series on sides of lower jaw; those of the outer and inner series in each jaw are somewhat enlarged, the largest being a single series in sides of lower jaw. Preopercular spine as usual in the genus. Scales smooth above and below, ctenoid on sides.

Color in spirits brown, lighter above and below; each scale on middle of sides with a dusky streak, these forming obscure lengthwise lines; back anteriorly with a few small black spots; under parts, including sides of head, very thickly punctulate with black; no dark stripes from orbit. Lips black; a dark streak from snout through eye to upper angle of preopercle; two dusky streaks from eye downwards and backwards across cheeks; a very conspicuous black blotch as large as eye in front of upper pectoral rays. Pectorals and ventrals transparent, dusky; vertical fins all barred with light and dark in fine pattern.

Coast of South Carolina; known from a single specimen, 4 inches long, No. 2009, L. S. Jr. Univ. Mus.; taken in the harbor of Charleston, by Dr. Gilbert.

This species agrees very well with Cope's account of *Culius amblyopsis*, but the eye is smaller and there is some difference in color, besides the remote habitat.

16. **Evermannia longipinnis** (Steindachner).

Gobiosoma longipinnis Steindachner, Ichth. Beitr., viii, 27, 1879. Las Animas Island, Gulf of California.

At my request, Dr. Steindachner has re-examined the types of his *Gobiosoma longipinnis*. He finds them completely scaleless, as originally described. The species cannot then be placed in the genus *Clevelandia*, as in Dr. Eigenmann's arrangement, but is nearest to *Evermannia*.

17. **Clevelandia rosæ** Jordan & Evermann, n. sp.

Clevelandia longipinnis, Eigenmann & Eigenmann, Proc. Cal. Ac. Sci., 1888, 73. San Diego. Not *Gobiosoma longipinne* Steindachner.

The species described from San Diego by Dr. and Mrs. Eigenmann, under the erroneous name of *Clevelandia longipinnis*, and made the type of the genus *Clevelandia*, must receive a new name. We suggest that of *Clevelandia rosæ*, in honor of Mrs. Rosa Smith Eigenmann, its discoverer.

Family URANOSCOPIDÆ.

18. **Kathetostoma averruncus** Jordan & Bollman. Plate xxxi.

Kathetostoma averruncus Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 163, southwest of Panama.

A figure of this interesting species of Star Gazer is here given from the original type.

Family DACTYLOSCOPIDÆ.

19. **Gillellus semicinctus** Gilbert. Plate xxxii.

Gillellus semicinctus Gilbert, Proc. U. S. Nat. Mus., 1890, 98. Gulf of California.

I present a figure of this interesting species from one of the types.

20. **Dactylagnus mundus** Gill. Plate xxxiii.

I present a figure of this species from a specimen obtained by Dr. Gilbert while with the Albatross. The genus is a valid one, well separated from *Doctyloscopus*.

Family GOBIESOCIDÆ.

21. **Bryssetæres pinniger** (Gilbert). Plate xxxiv.

> *Gobiesox pinniger* Gilbert, Proc. U. S. Nat., 1890, 94. Puerto Refugio, Gulf of California.

This species is the type of a distinct genus, *Bryssetæres* Jordan & Evermann, distinguished from *Gobiesox* by the long dorsal fin. The vertebræ are 26, as in *Gobiesox*. The plate here given is from one of the type specimens. The name *βρύσσος*, sea-urchin; *ἡταίρος*, comrade, alludes to the brotherhood existing between the Clingfishes and the Sea-urchins in the rock pools.

22. **Arbaciosa humeralis** (Gilbert). Plate xxxv.

> *Gobiesox humeralis* Gilbert, Proc. U. S. Nat. Mus., 1890, 95. Puerto Refugio.

This species, with its allies *zebra*, *eos*, *rhessodon*, etc., differs from *Gobiesox* in the serrated teeth. It may be made the type of a distinct genus, *Arbaciosa* Jordan & Evermann.

The name is given in allusion to the close association in the rock pools between the Sea-urchins and the species of this genus. This relation is especially close between the Sea-urchin, *Arbacia stellata* and *Arbaciosa zebra*.

23. **Arbaciosa rhessodon** (Rosa Smith). Plate xxxvi.

I present a figure of this interesting species from a specimen from San Diego.

24. **Arbaciosa eos** (Jordan & Gilbert). Plate xxxvii.

I here present a figure of a specimen from Mazatlan.

25. **Rimicola muscarum** (Meek & Pierson).

Gobiesox muscarum Meek & Pierson, Proc. Cal. Ac. Sci., 1895, with plate. Monterey.

This species is distinguished from *Gobiesox* by the narrow body and very small dorsal and anal fins. It may be regarded as the type of a new genus, *Rimicola* Jordan & Evermann. To the same genus, *Gobiesox eigenmanni* Gilbert may be referred. *Rimicola muscarum* has been well figured by Meek & Pierson.

26. **Rimicola eigenmanni** Gilbert. Plate xxxii.

I present a figure of the type of this species from Todos Santos Bay.

Family BATRACHOIDIDÆ.

27. **Thalassophryne dowi** Jordan & Gilbert. Plate xxxviii.

Thalassophryne dowi Jordan & Gilbert, Proc. U. S. Nat. Mus., 1887, 388. Panama.

I present a figure of this interesting species, taken from a specimen from Panama, larger than the original type.

I may notice that *Batrachus* Bloch & Schneider, 1801, is a synonym of *Batrachoides* Lacépède, 1800, and cannot be used as the name of a distinct genus. None of the naked Toad-fishes were known to Schneider. The oldest generic term available for them is that of *Opsanus* Rafinesque, *Opsanus cerapalus* is identical with *Batrachus tau*, which must stand as *Opsanus tau*.

Family BLENNIIDÆ.

28. **Starksia cremnobates** (Gilbert).

Labrisomus cremnobates Gilbert, Proc. U. S. Nat. Mus., 1890, 100. Gulf of California.

This pretty species seems to be the type of a distinct genus, *Starksia* Jordan & Evermann, distinguished from *Labrisomus* by the large scales, presence of palatine teeth, the short, soft dorsal and the absence of the comb of nuchal filaments. It is named for Mr. Edwin Chapin Starks, in recognition of his work on the fishes of the Pacific Coast.

29. **Exerpes asper** (Jenkins & Evermann).

Auchenopterus asper Jenkins & Evermann, Proc. U. S. Nat. Mus., 1888, 154. Guaymas.

The widely separated and ribbon-like first dorsal fin, formed of three close set spines, may distinguish *asper* generically from the other species of *Auchenopterus*. The genus *Exerpes* Jordan & Evermann, based on it, is further distinguished by the long, sharp snout, and the long ventrals. The species has been well figured by Jenkins & Evermann. (Proc. U. S. Nat. Mus., 1891; plate II.)

30. **Chasmodes jenkinsi** Jordan & Evermann, n. sp. Plate xxxix.

Hypsoblennius striatus Evermann & Jenkins, Proc. U. S. Nat. Mus., 1891, 163, Guaymas, not of Steindachner.

Head 3⅓ (4 in total); depth 4 (5). D. XII, 17; A. 18 or 19; eye 4 to 5 in head.

Body more robust than in related species, resembling *Hypsoblennius;* head large, gently rounded in profile, the snout steep, 4 in head; interorbital space narrow, grooved; orbital tentacle (male) much as in *Hypsoblennius gilberti*, about 3 in head, branched, the branches usually 4; mouth much larger than in *Hypsoblennius*, the maxillary 2¾ to 3 in head, reaching to below posterior margin of eye; teeth even, comb-like; gill opening 2 in head, extending downwards nearly to lower edge of pectoral, much larger than in *Chasmodes saburræ.* Dorsal little notched, the spines slender, 2½ in head, the rays a little higher; anal lower, the rays 3½ to 4 in head; pectorals reaching anal, 1⅓ in head; ventrals 2¼. Dorsal and anal free from caudal.

Color in life, according to Evermann & Jenkins, yellowish; five quadrate spots of darker extending from dorsal to a line drawn from middle of eye to lower base of caudal, the anterior one above tip of pectoral; median line of side with a more or less distinct series of small spots; a short dark vertical line behind the eye; a dark blotch in front of origin of dorsal fin and another on humeral region; under side of head with two ill-defined bands of dark; dorsal fin more or less speckled with black, the anal with a narrow white border above which is a broader band of deep brown.

Six specimens, the largest about 3 inches long, were obtained at Guaymas, Sonora, by Dr. Evermann and Dr. Jenkins in 1887. One of these, No. 412, L. S. Jr. University Mus., examined by us, is the type of the present description.

The large mouth distinguishes this species at once from *Hypsoblennius striatus*, with which it has been identified. The species is intermediate between typical *Chasmodes* and *Hypsoblennius*, and its discovery may make it necessary to merge the latter in *Chasmodes*.

31. **Runula azalea** Jordan & Bollman. Plate xxxvii.

Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 171. Indefatigable Island.

I present a plate taken from one of the types of this interesting little Blenny.

32. **Lucioblennius alepidotus** Gilbert. Plate xxxvii.

Gilbert, Proc. U. S. Nat. Mus., 1890, 103. Gulf of California.

The genus *Lucioblennius* is very close to *Chænopsis* of the West Indies, and belongs to the *Chænopsinæ*. It is not possible to separate this group, as a family, from the *Blenniidæ* until the various intermediate subfamilies, *Pholidichthyinæ*, *Pseudoblenniinæ*, *Emblemariinæ* and *Ophio-*

blenniinæ are better known. The accompanying plate is from one of the types.

Family LYCODAPODIDÆ.

33. **Lycodapus fierasfer** Gilbert. Plate xxxiii.

Lycodapus fierasfer Gilbert, Proc. U. S. Nat. Mus., 1890, 108. Station 2980, etc.

The genus *Lycodapus* cannot be retained among the *Zoarcidæ*, as its general relations are with *Fierasfer* rather than *Lycodes*. It seems to represent a distinct family (*Lycodapodidæ*) distinguished from *Fierasfer* by the normal position of the vent, which is not at the throat. Its gill membranes are separate and free from the isthmus. The accompanying plate is taken from one of the types.

Family BROTULIDÆ.

34. **Bregmaceros macclellandi** (Thompson).

Bregmaceros macclellandi Thompson, Charlesworth's Mag. Nat. Hist., 1840. India.

Bregmaceros bathymaster Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 178. Off Coast of Colombia, near Panama.

Two additional specimens of the species called *Bregmaceros bathymaster* have been found since the species was first described. They are from the same locality, having been mislaid in the removal of the collection. These are in better condition than the first and seem to agree fully with the accounts of *B. macclellandi*.

The genus *Bregmaceros* has the hypercoracoid perforate, as in the *Brotulidæ*. It cannot therefore be placed among the *Gadidæ*, but belongs very near the *Brotulidæ*, if it be not a genuine member of that family.

The remainder of this paper consists of notes by Mr. Frank Cramer on some new or little-known species of *Sebastodes*. This matter is supplementary to Mr. Cramer's recent paper on the Cranial Characters of *Sebastodes*, Proc. Cal. Acad. Sci., 1895, pp. 573 to 611.

Family SCORPÆNIDÆ.

35. **Sebastodes ciliatus** (Tilesius). Plate xl.

Head 3¼, depth 3 to 3¼: D. XIII, 16; A. III, 8; P. 18 to 19. Transverse (oblique) rows of scales 46 to 47 (+ 3 or 4 on caudal). Pores 46 to 47. Body compressed, deep, its width over the base of the pectorals about 2 in the depth. Dorsal outline descending rapidly backward in a slight curve from origin of first dorsal to end of second dorsal. Depth of peduncle more than 3 in depth of body. Head compressed, profile steep and nearly straight. Eye moderate, orbit circular, 3⅔ in head, a little longer than snout, its posterior rim at about the middle of length of head. Interorbital space strongly convex, its width a little less than orbit, $3\frac{6}{7}$ to 4 in head. Nasal spines small; cranial ridges and spines all obsolete, except the parietal; parietal ridges very slightly developed, with a minute point or none, covered with scales. Mouth moderate, quite oblique; tip of upper jaw on a level with center of eye; maxillary 2⅓ in head, its posterior end reaching about to vertical from posterior edge of pupil. Lower jaw a little projecting, with a slight symphyseal knob. Very narrow bands of teeth on jaws, vomer and palatines. Preorbital moderate, its lower edge scarcely at all indented or entirely continuous, spineless. Suborbital stay scarcely visible. Preopercular spines small, the three upper directed backward and slightly diverging, nearly equidistant and of equal size, the two lower minute or obsolescent. Opercular spines small, without visible ridges. Gill-rakers slender, 2 in orbit, 23 to 24 on anterior limb of first arch. Dorsal fin rather low, the spines delicate, the 5th longest, 2¼ to 2⅙ in head, the 2d about equal to the 11th, the 12th about 1⅓ in the 13th; the membrane rather deeply incised anteriorly, and reaching about half way up the 13th spine. Soft rays about equal to the spines. Caudal fin slightly lunate, its length about 1½ in head. Second and third anal spines about equal in length, the former a little stronger, 1⅓ in the soft rays. Pectorals reaching very nearly to vent, a little less than head, 3½ in body, their base nearly 3 in their length, the median rays longest. Ventrals not reaching vent, about 1⅓ in pectorals. Scales on body, opercles and interorbital space strongly ctenoid; those on mandibles, maxillaries and most of those on cheeks cycloid; preorbital and snout with minute scales. Accessory scales few. Color, in alcohol, dark reddish brown, mottled with lighter; top of head nearly black, a dark stripe on edge of lower jaw, another on maxillary: a dark brown band from preorbital downward and backward to posterior edge of preopercle; a broader band from posterior rim of orbit downward and backward across preopercle and opercle. Fins all dusky, the dorsals somewhat mottled. Peritoneum black. The following description of the color is added from Jordan & Gilbert's Synopsis: "Blackish green, sides rather pale, much mixed with darker; dark shades from eye backward; a black streak on maxillary."

Coast of Alaska, rare; not noticed south of Kodiak when the specimens here described were taken. No other specimens are known, except those of Pallas still preserved in the museum at Berlin.

The above description is taken from three specimens 5¼ to 5¾ inches long, in the possession of the Alaska Commercial Company, one of them since presented to Leland Stanford Jr. University. The following is the synonymy of the species: *Epinephelus ciliatus* Tilesius, Mém. Acad. Sci. St. Petersb., iv. 474, 1810, Aleutian

Islands; *Perca variabilis* Pallas, Zoogr. Rosso-Asiat., iii, 241, 1811, Aleutian Islands, type; red specimens of *Sebastodes introniger* included as the summer coloration; *Sebastodes variabilis* Cuvier & Valenciennes, Hist. Nat. des Poiss., iv, 347; Günther, Cat. Fishes, ii, 99; *Sebastodes ciliatus* Jordan & Gilbert, Synopsis, 658, 1883.

36. **Sebastodes hopkinsi** Cramer. Plate xli.

Sebastodes hopkinsi Cramer, Proc. Cal. Acad. Sci., 1895, 594. Monterey.

Head 3, depth 3$\frac{2}{5}$; D. XIII, 14; A. III, 7. Transverse rows of scales (midway between lateral line and base of dorsal fin) about 52; pores about 51. Body compressed, not very deep, profile steep, depth of caudal peduncle a little less than orbit. Head compressed, eye large, orbit 3½ in head. Interorbital space evenly convex, 4½ in head; cranial ridges nearly obsolete; parietal ridges very low but broad, brown. Nasal spines small, far apart; preocular spines rather strong, triangular, supraocular and postocular usually present, very minute, tympanic and parietal spines sometimes present. Mouth moderate, oblique; maxillary very little more than 3 in head, nearly reaching vertical from center of pupil, its posterior end very broad, two in orbit. Lower jaw much projecting, with a prominent, forward directed symphyseal knob, which enters the profile. Narrow bands of teeth on jaws, vomer and palatines. Preorbital rather narrow, its lower margin lobate, with sometimes a small spine. Preopercular spines flat, sharp, nearly equidistant, all directed backward, the 2d longest, 4th and 5th minute. Opercular spines flat, sharp, somewhat diverging, the upper considerably larger; spines on shoulder weak. Gill-rakers 29 on anterior limb of first arch, long, slender, very little more than two in orbit.

Dorsal spines slender, low, the 4th longest, 2$\frac{3}{5}$ in head, the 12th ⅔ as long as longest; soft rays equal to longest spines. Only a slight notch between the dorsals. Caudal lunate, 1⅗ in head; second anal spine stronger and considerably longer than third, longer than soft rays, longer than longest dorsal spine, very little more than two in head. Pectorals reaching beyond ventrals but not to vent, a little less than head, 3½ in body; their base narrow, equal to orbit, the lower rays not thickened. Scales rather small, everywhere strongly ctenoid, accessory scales not very numerous; preorbital, snout, maxillaries, mandible and branchiostegal rays scaled; all the fin rays more or less scaly. Color much as in *Sebastodes ovalis*, but with dark blotches and no dark specks. Dark olivaceous, tinged with reddish, especially below; a large, irregular dark blotch under soft dorsal, crossing lateral line; a smaller one on lateral line below posterior part of spinous dorsal; top of head and anterior part of back to about 9th dorsal spine nearly uniformly dark to below lateral line; two indefinite dark bands from behind orbit across preopercle and opercle; lips black. Dorsal fin olivaceous, spinous dorsal dark-edged, soft dorsal darker at base; caudal and pectorals olivaceous, axils dark, ventrals yellowish, anal pale; no small round black spots anywhere. Peritoneum black. Bones of skull thin, cranial ridges nearly obsolete, parietal bones meeting, interorbital space somewhat convex, 3⅓ in base of skull, a slight depression on each side of a sharp, narrow median ridge, and another just within each supraocular ridge; ventral process of basisphenoid rudimentary, mesethmoid processes compressed, not elevated; base of skull very strongly curved. Closely related to *Sebastodes ovalis*. Types 7¾ inches long. No. 2282, L. S. Jr. Univ.

This species is thus far known from Monterey Bay, California, whence the six specimens before us were taken. It is named for Mr. Timothy Hopkins, founder of the Hopkins Seaside Laboratory at Monterey. Since this description was written, numerous additional examples have been secured. It is evidently not rare about Monterey.

37. Sebastodes eigenmanni Cramer, n. sp. Plate xlii.

Head $2\frac{7}{10}$; depth $2\frac{5}{6}$. D. VIII, 14; A. III, 8; P. 18 $(\frac{9}{9})$; Lat. 1; pores 41 (+2 on base of caudal); transverse rows of scales 41.

Body compressed, its width (behind opercles) about $2\frac{1}{2}$ in its depth. Greatest width of head $2\frac{2}{5}$ in its length. Profile steep; interorbital space flat, $5\frac{1}{7}$ in head; supraocular and parietal ridges quite well developed, the former flat, the latter diverging backward. Preocular, supraocular, postocular, tympanic and parietal spines present, not very large, but sharp; a curved shallow groove at each side of the interorbital space inside of the supraocular ridges. Orbit large, nearly circular, $3\frac{1}{4}$ in head, its upper rim on a level with the profile. Snout short, about equal to interorbital width; preorbital moderate, with two small sharp spines directed downward and backward; maxillary $2\frac{2}{5}$ in head, reaching a little beyond vertical from posterior edge of pupil; mandible projecting somewhat, with a moderate symphyseal knob. The uppermost preopercular spine small, directed a little upward, the second longest, horizontal, the fourth and fifth small, but evident; upper opercular spine slender and sharp, the lower shorter. Gill-rakers long and slender, about $2\frac{1}{3}$ in the orbit, 23 on horizontal limb of first arch. Scales rough, ctenoid, those on opercles, cheeks and interorbital space and snout somewhat rough; those on maxillary, mandible and breast mostly cycloid; very few accessory scales. Spines of first dorsal moderate, the fourth longest, $2\frac{1}{4}$ in head, the fifth, sixth and seventh nearly equal, the twelfth $2\frac{1}{4}$ in the fourth; the membrane deeply incised; longest dorsal ray about equal to longest spine. Anal spines graduated; the second nearly as long as and but little stronger than third, $2\frac{3}{5}$ in head, $1\frac{1}{3}$ in the soft rays. Caudal truncate, or a little rounded (the rays somewhat injured). Base of pectorals 4 in head, the nine lower rays simple, the middle rays longest, reaching a little beyond vent, $3\frac{1}{5}$ in length of body. Ventrals reaching vent.

Color in alcohol: Reddish-brown; pale below; dorsals and pectorals dusky; membranes of spinous dorsal black-edged, and tips of ventrals blackish. Peritoneum white, with a few black specks.

One specimen, 7 inches long, taken at Monterey, California, by Dr. Wilbur W. Thoburn; No. 4046, L. S. Jr. Univ. Mus.

It is named for Dr. Carl H. Eigenmann, of the University of Indiana, in recognition of his work on the genus *Sebastodes*. The species is nearest to *Sebastodes ovalis*, but the mouth is larger and the color different.

38. **Sebastodes darwini** Cramer, n. sp.

?*Sebastes oculata* Jenyns, Voyage H. M. S. Beagle, Zool. Fish. No. ii, part iv, 37, 1840, Valparaiso.

Closely allied to *Sebastodes rosaceus*. Spines similar in number, but a trifle higher; upper spines on preopercle longest. Gill-rakers slender, $x+18$, nearly as long as pupil. Jaws subequal. Pectoral short, $1\frac{1}{3}$ in head, the lower rays thickened; second anal spine long, curved. A. III, 6. Compared with a specimen of *S. rosaceus* of the same size, the snout is blunter in *S. darwini*, the cranial ridges are a shade higher; the pectoral is shorter, reaching only to vent (while in *S. rosaceus* it reaches to second anal spine: second anal spine much longer than third (subequal in *S. rosaceus*): dorsal spines lower, 3 in head (2⅔ in *rosaceus*). Scales similar. Mexillones, Peru.

Here described from MS. notes of Dr. D. S. Jordan, taken from the type in Mus. Comp. Zool., Cambridge, Mass.

Jenyns described a specimen from Valparaiso as the *Sebastodes oculatus* of Cuvier and Valenciennes; but pointed out distinctions between the two, which with later knowledge of related species prove beyond a doubt that it is distinct. This specimen probably belongs to *Sebastodes darwini*. Jenyns also mentions a figure of another species from Valparaiso, very distinct from the others in having the spines of the head less developed. More than 50 species of the genus have been described from the north temperate waters of the Pacific Coast of America, and it is not improbable that the species of this genus will be found numerous in the temperate waters of the South American Coast.

39. **Sebastodes gilberti** Cramer, n. sp. Plate xliii.

Head $2\frac{7}{10}$; depth 2¾ to 3. D. XIII, 13. A. III, 6. P. 17; transverse (oblique) rows of scales 40 to 42; lat. l. (pores) about 39 to 42. Body somewhat compressed, its width over the base of the pectorals nearly two in the depth. Head compressed, profile steep, nearly straight. Preocular, postocular, tympanic and parietal spines and ridges present, all rather delicate, these spines somewhat appressed, the parietal ridges diverging backward in slight curves. Interorbital space 1½ in orbit, a little concave, with a pair of low ridges and a shallow median groove between them. Orbit high up, nearly circular, 4 in head, its posterior rim at about the middle of length of head. Preorbital scarcely lobate on its ventral margin, usually with one short triangular spine posteriorly. Suborbital stay not visible externally. Preopercular spines all directed backward, the two uppermost closer together, the two lowermost weak. Opercular spines rather small, sharp, without visible ridges. Mouth nearly horizontal, the tip of the upper jaw nearly on a level with the lower rim of the orbit. Maxillary 2$\frac{2}{7}$ in head, its posterior end reaching about to vertical from posterior rim of orbit. Lower jaw very slightly projecting, with a slight symphyseal knob. Teeth on jaws, vomer and palatines, the bands on the latter narrow. Gill-rakers rather slender, 2 to 3 in orbit, 23 on anterior limb of first arch.

Fourth dorsal spine highest, 1$\frac{1}{13}$ in head; membrane of first dorsal very deeply incised, reaching only ¼ of the way up on the anterior side of the 3d, and about ⅓ of the way up on the 4th spine, nearly to the tip of the 12th, and about half way up on the 13th spine; soft rays lower than the spines, about 1⅓ in the longest spine. Caudal fin truncate, with 11 to 12 full length rays, about 1$\frac{3}{5}$ in head. Second anal spine longer and much stronger than third, 2$\frac{2}{5}$ in head, 1$\frac{1}{5}$ in the soft rays. Pectoral fin reaching to or a little beyond vent, 3¼ in length of body, the median rays longest, the 8 lower rays unbranched and thickened; base of fin 3 in its length. Ventrals reaching not quite to vent, the spine about equal to the 3d anal spine.

Scales rather small, those of body, cheeks and interorbital space all ctenoid, those on breast cycloid; maxillary with minute scales, lower jaw and top of snout naked. Accessory scales few, some of them ctenoid.

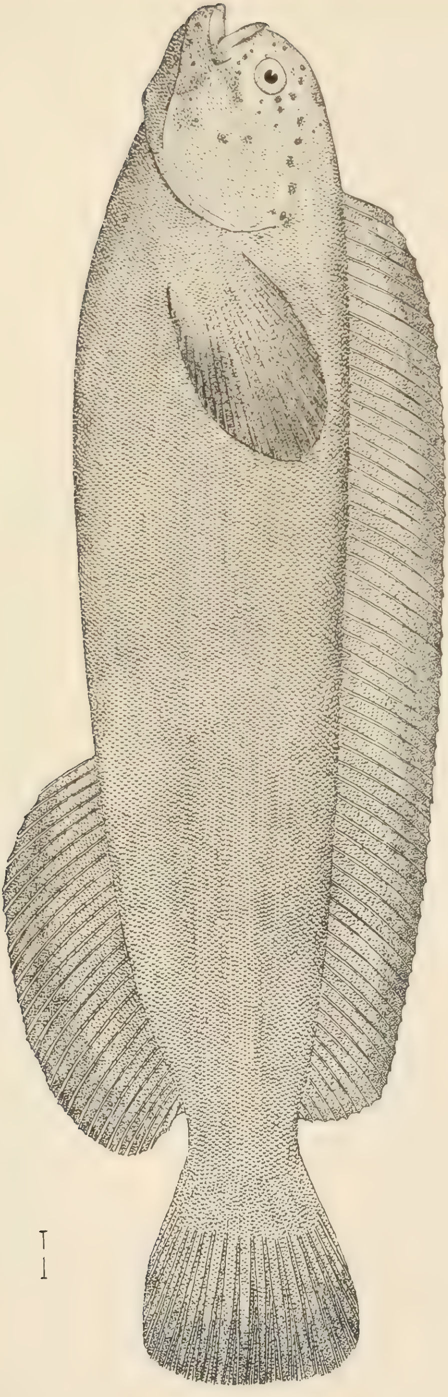
Color: Head blackish above, lips dusky, a dark band from front of orbit forward along side of snout; a dark stripe on maxillary; a blackish or olivaceous band from preorbital backward and downward across preopercle; another broader band from posterior rim of orbit across preopercle and lower end of subopercle; a dark blotch on opercle: a blackish area in front of dorsal and under first and second spines, extending with interruptions to axils of pectorals and on to the base of the fin, and downward and backward in a narrow broken band toward vent; another band from below 6th and 7th dorsal spines downward and backward nearly to origin of anal; a third short one from below 9th and 10th spines to lateral line: a broad one under soft dorsal extending below lateral line, and another across peduncle; all these dark areas extend up on the dorsal fin; their outlines are not sharply defined, and they as well as the lighter areas of the body are mottled with scattered, much darker spots; the lighter areas were in the fresh state a dull brick red, becoming lighter below. Dorsal membrane blackish between 1st and 3d, and between 5th and 11th spines. Soft dorsal spotted with blackish anteriorly: membrane of caudal dusky, the dark much broken into spots; anal and ventrals dusky. Pectorals with a broad, transverse, dark, spotted band near base, and a transverse dusky area with darker spots on distal half. Fins in life more or less tinged with the reddish color. Peritoneum white. Types, three specimens 7½, 8¼ and 8½ inches long (No. 3893, L. S. Jr. Univ.), from Monterey, found in San Francisco market. Many others have been since obtained from Monterey, where it is common. The species is an ally of *Sebastodes carnatus* and *Sebastodes chrysomelas*. It had been previously confounded with the young of *Sebastodes carnatus*. It seems to reach a smaller size than any of the related forms.

This species is named from Prof. Charles Henry Gilbert, of Leland Stanford Junior University.

LIST OF PLATES.

XX. Zaprora silenus: type. Nanaimo, British Columbia.
XXI. Nemichthys avocetta. Victoria, British Columbia.
Avocettina gillii. Albatross Station, off Oregon.
XXII. Salmo gairdneri crescentis: type. Lake Crescent, Washington.
XXIII. Salmo gairdneri beardsleei: type. Lake Crescent, Washington.
XXIV. Xenocys jessiæ: type. Charles Island, Galapagos.
XXV. Umbrina sinaloæ: type. Mazatlan, Mexico.
XXVI. Emmydrichthys vulcanus: type. Hawaiian Islands.
XXVII. Cottus annæ: type. Eagle River, Gypsum, Colorado.
XXVIII. Tarandichthys filamentosus: type. Off Santa Barbara Islands.
XXIX. Icelinus quadriseriatus. Coast of California.
XXX. Ulca marmorata. Unalaska.
XXXI. Kathetostoma averruncus: type. Off Panama.
XXXII. Gillellus semicinctus: type. Gulf of California.
Rimicola eigenmanni: type. Todos Santos Bay, Baja California.
XXXIII. Dactylagnus mundus. Gulf of California.
Lycodapus fierasfer: type. Albatross Station, 2980, N. W. Coast of Mexico.
XXXIV. Bryssetæres pinniger: type. Puerto Refugio, Gulf of California.
XXXV. Arbaciosa humeralis: type. Puerto Refugio, Gulf of California.
XXXVI. Arbaciosa rhessodon. San Diego, California.
XXXVII. Arbaciosa eos. Mazatlan, Mexico.
Runula azalea: type. Indefatigable Island.
Lucioblennius alepidotus: type. Gulf of California.
XXXVIII. Thalassophryne dowi. Panama.
XXXIX. Chasmodes jenkinsi: type. Guaymas, Mexico.
XL. Sebastodes ciliatus. Kodiak Island, Alaska.
XLI. Sebastodes hopkinsi: type. Monterey, California.
XLII. Sebastodes eigenmanni: type. Monterey, California.
XLIII. Sebastodes gilberti: type. Monterey, California.

PLATE XX.



ZAPRORA SILENUS

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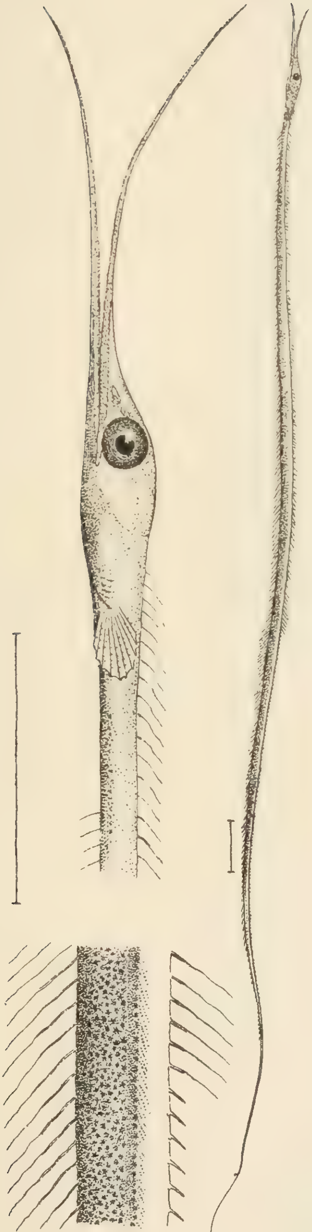
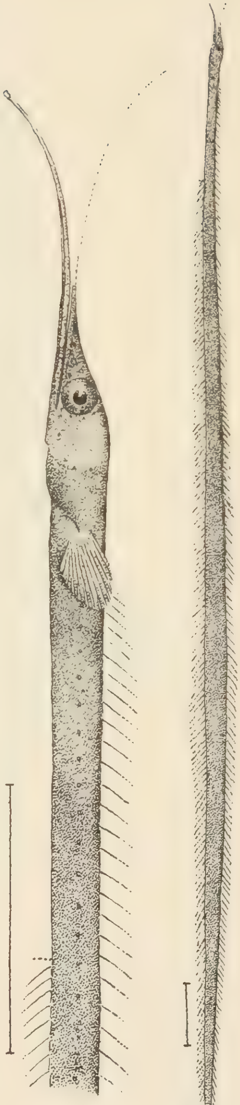
PLATE XXI.



NEMICHTHYS AVOCETTA



AVOCETTINA GILLII

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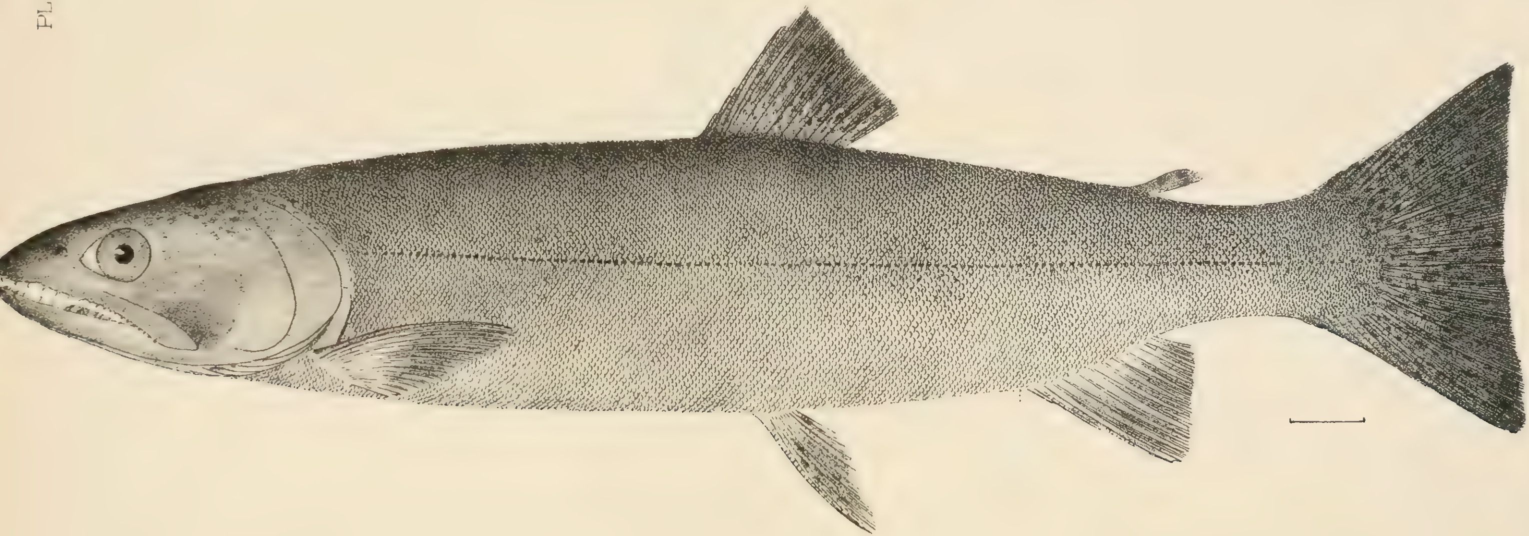
PLATE XXII.



SALMO GAIRDNERI CRESCENTIS

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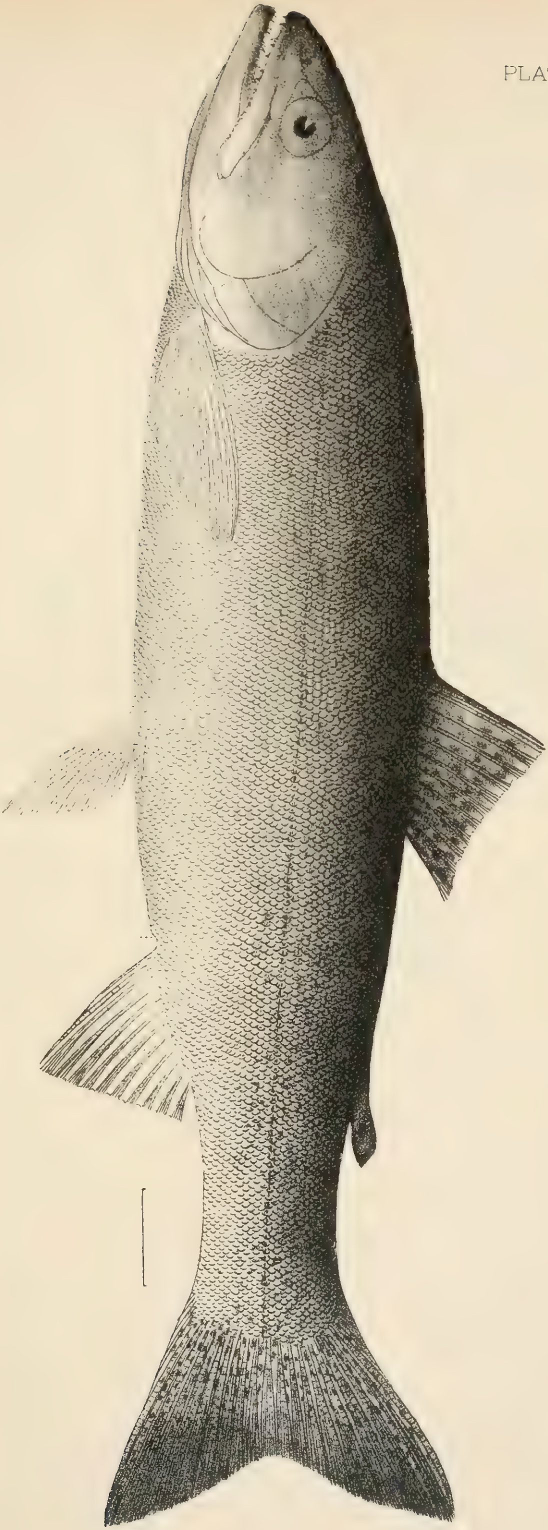
LITH. BRITTON & REY, S.F.

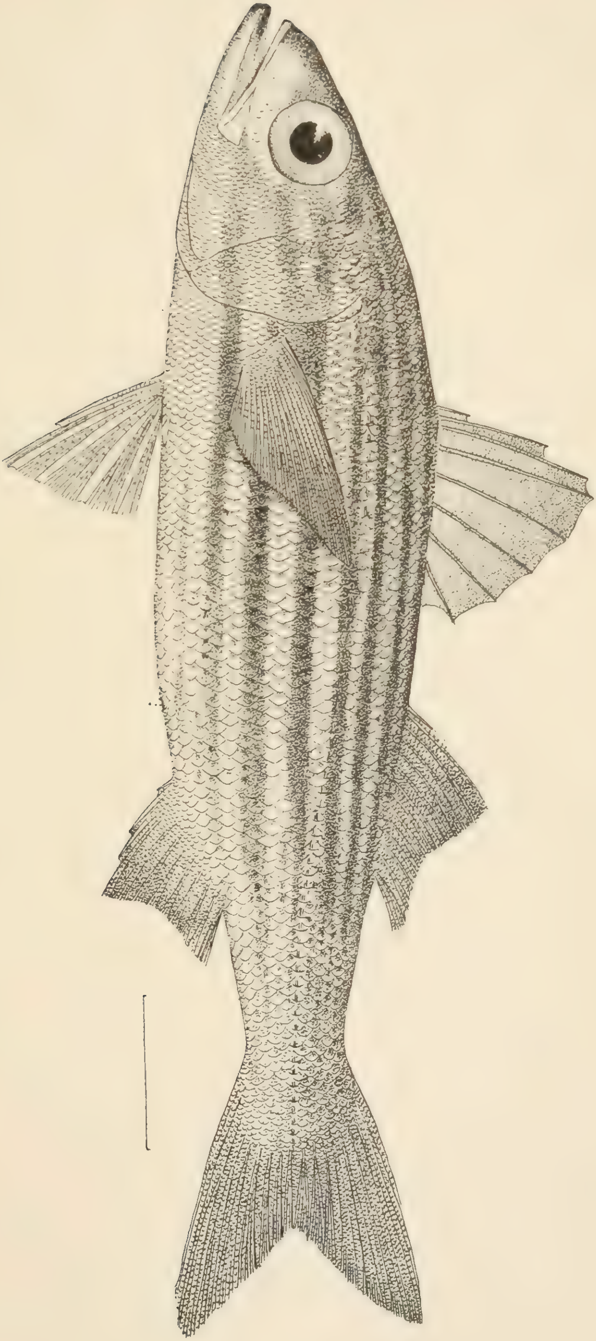
PLATE XXIII.



Anna L.R. del. ad. Nat.

SALMO GAIRDNERI BEARDSLEEI

LITh. BRITTON & REY. S.F.



XENOCYS JESSIÆ

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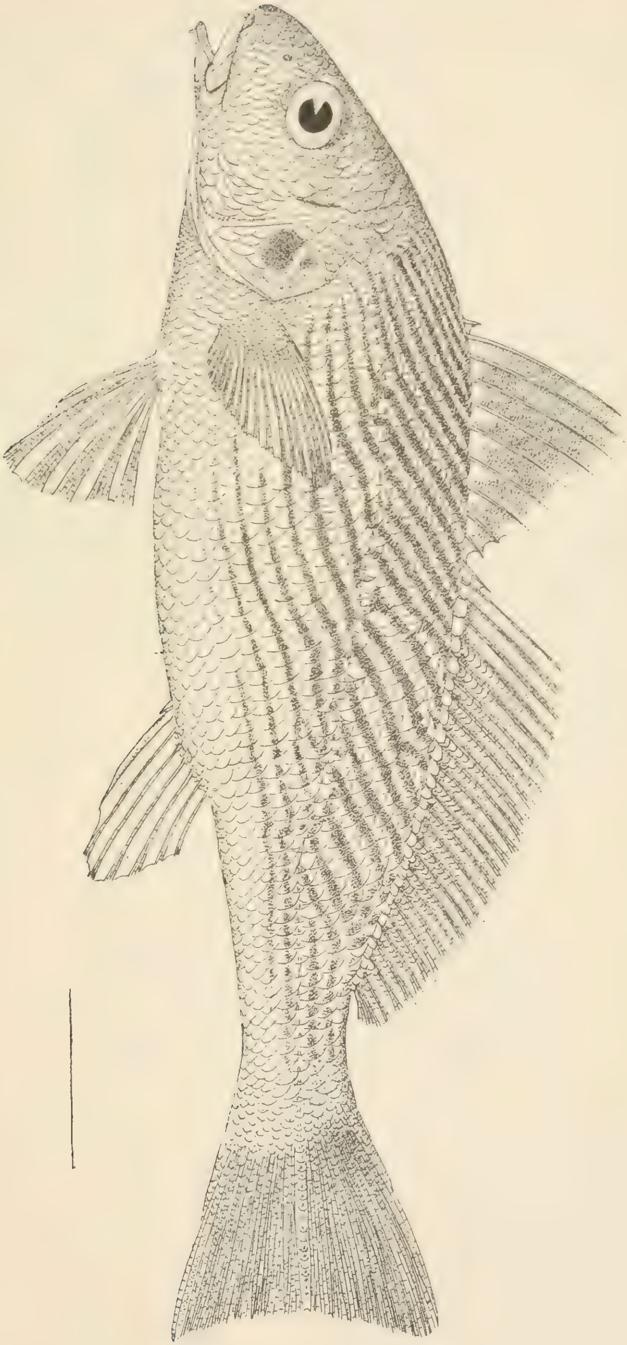
Lith. Britton & Rey, S.F.



UMBRINA SINALOÆ

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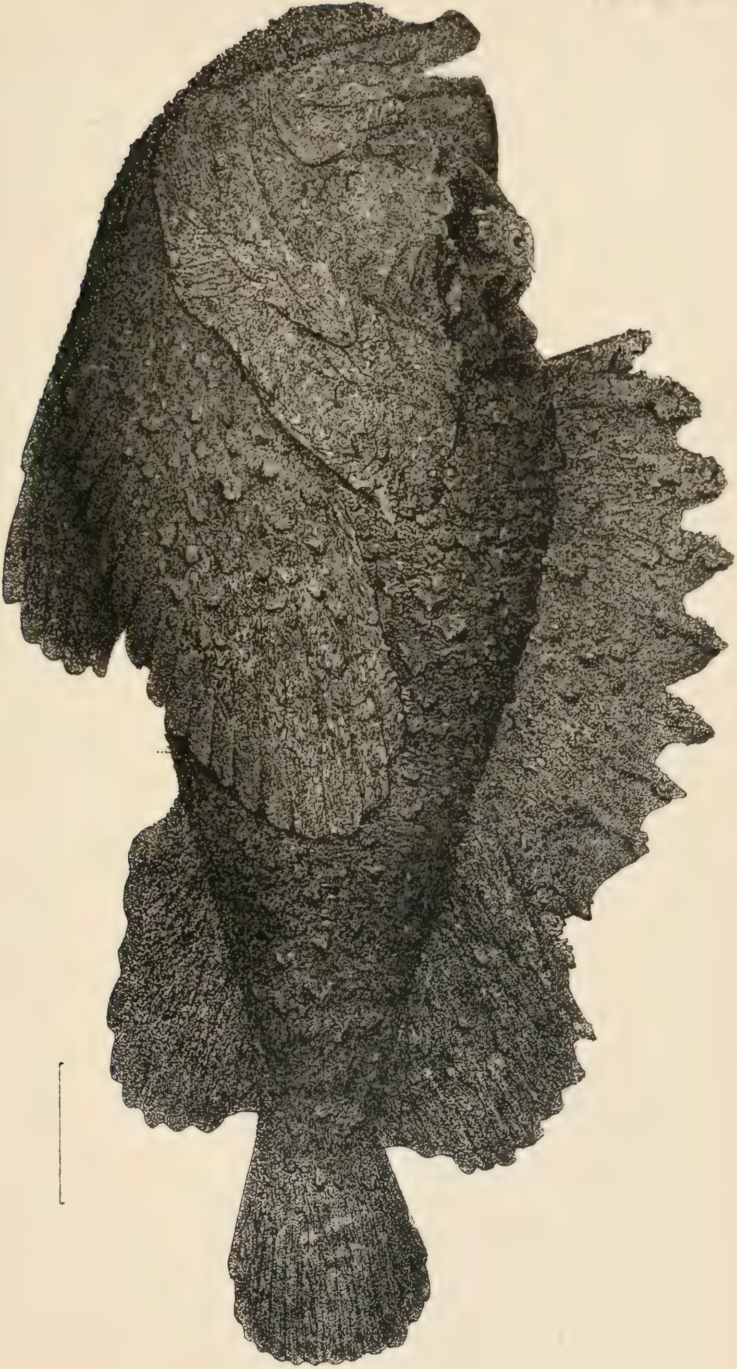
PLATE XXVI.



EMMYDRICHTHYS VULCANUS

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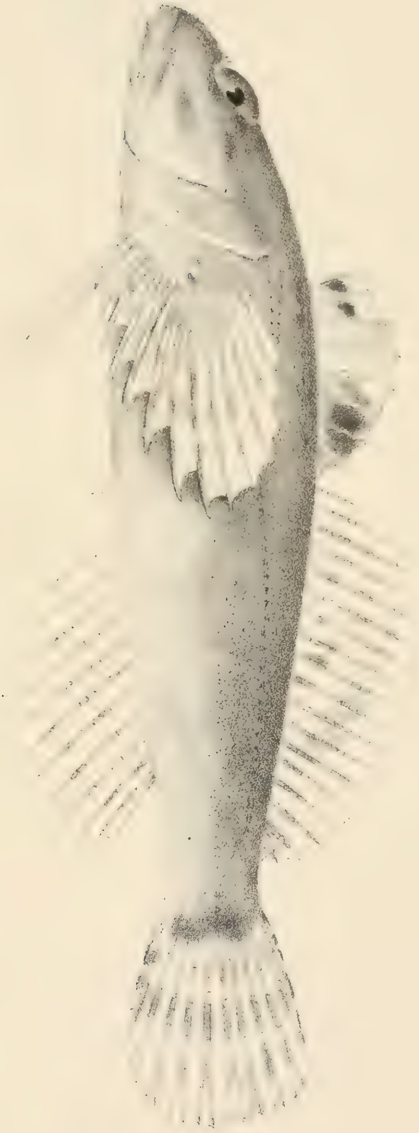
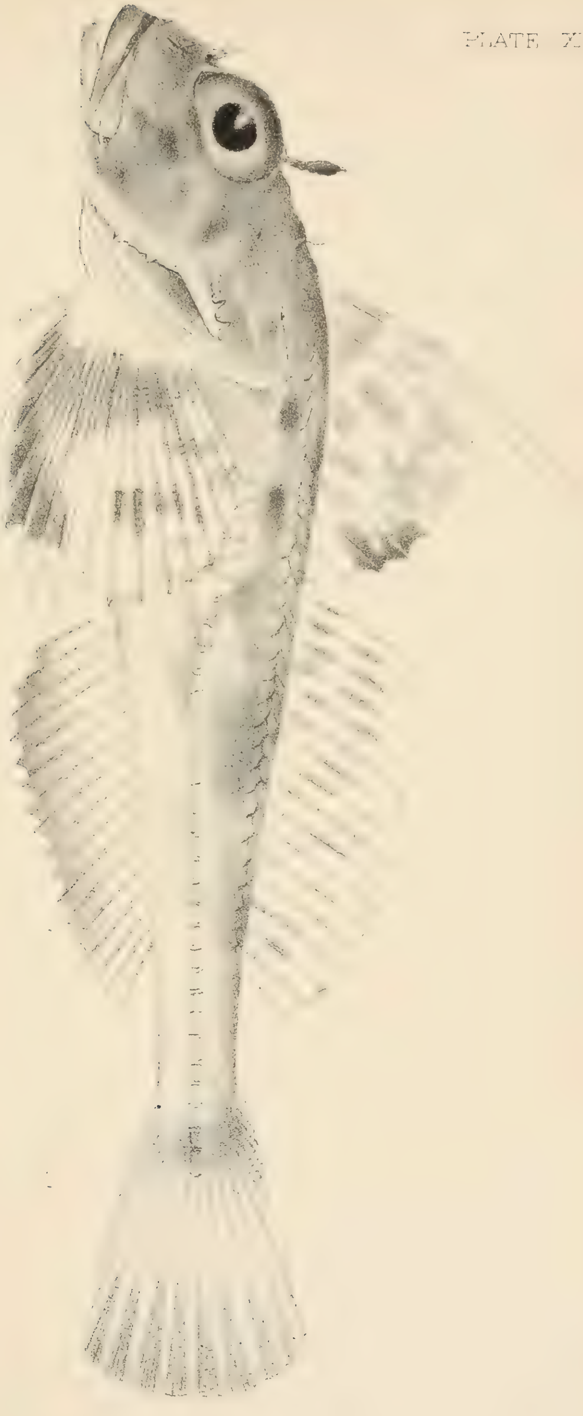
PLATE XXII



COTTUS ANNÆ

Anna L. Brown Del. [illegible]

PLATE XLVIII.



TARANDICHTHYS FILAMENTOSUS

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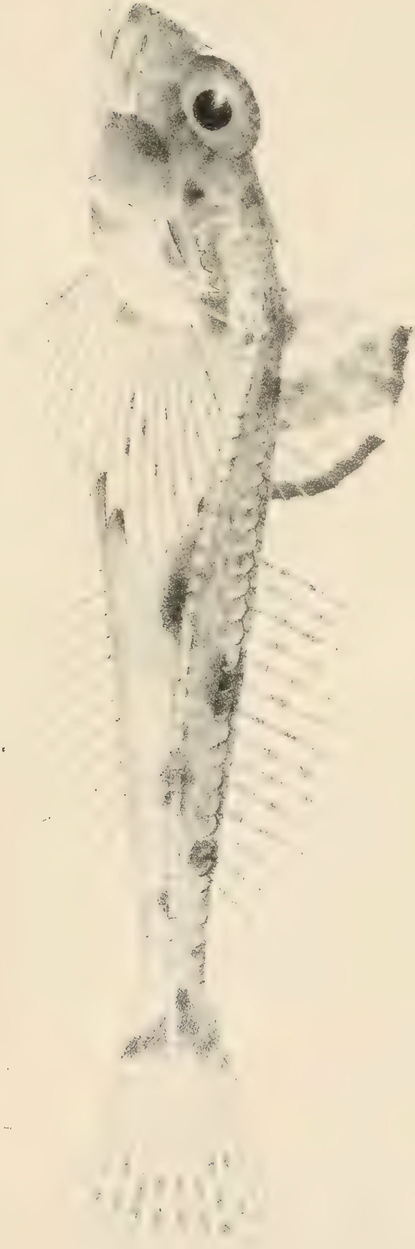
PLATE XXIX.



ICELINUS QUADRISERIATUS

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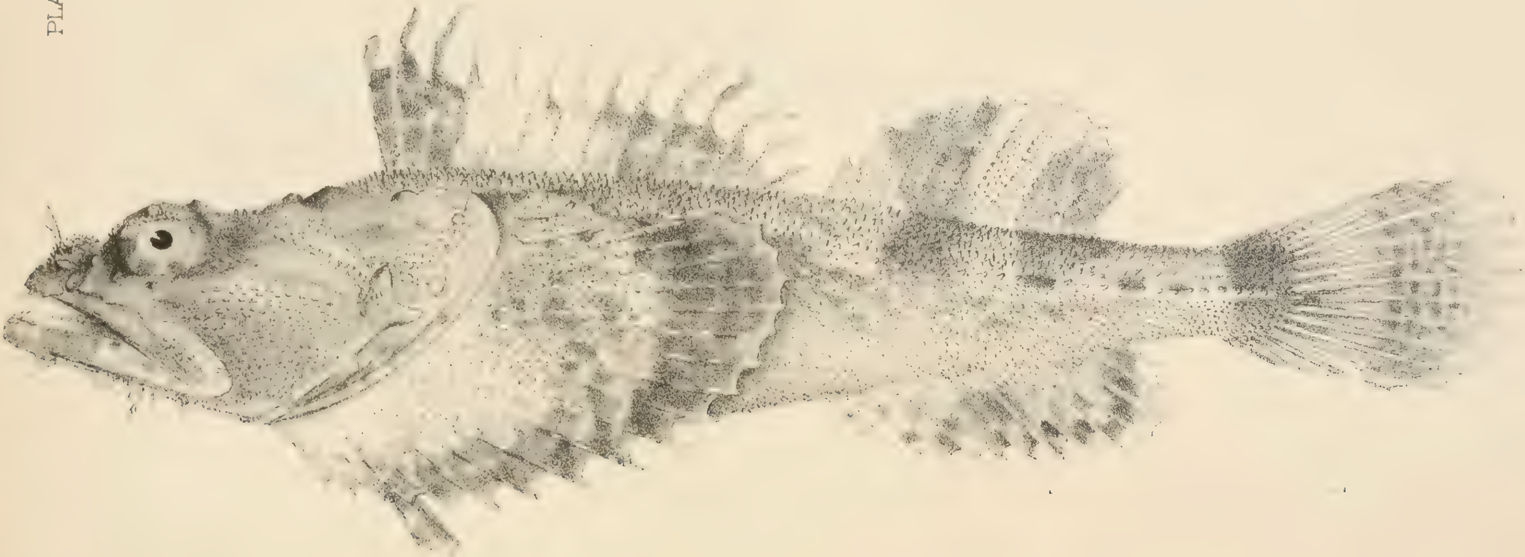
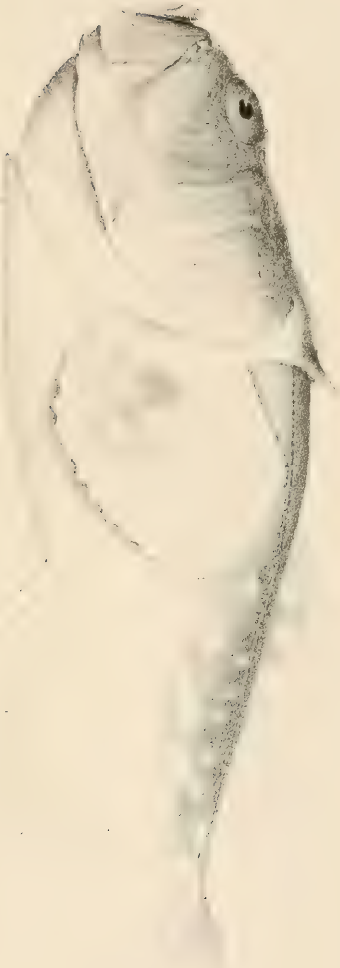
Lith. Britton & Rey S



ULCA MARMORATA

[illegible] del. L. H. Prang & Co. Lith.

PLATE XXXI



KATHETOSTOMA AVERRUNCUS

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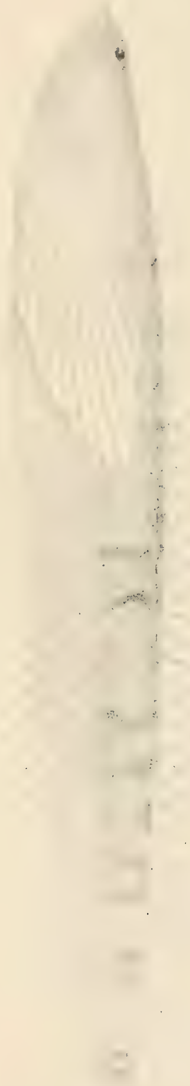
PLATE XXI.

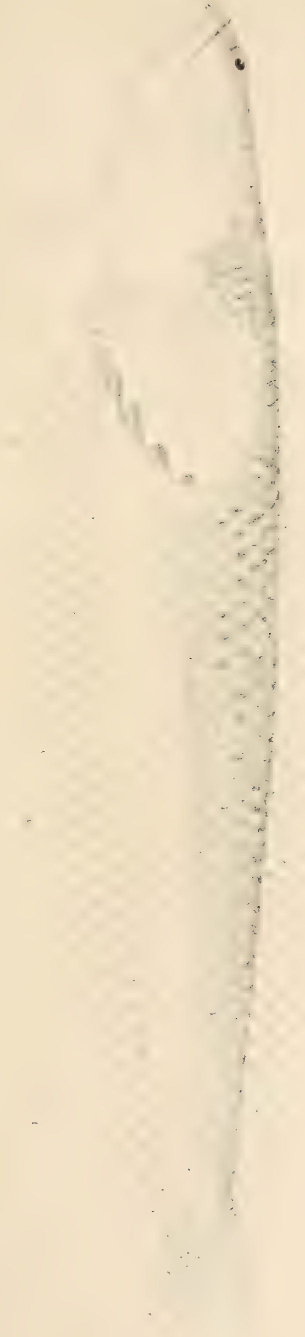
RIMICOLA EIGENMANNI



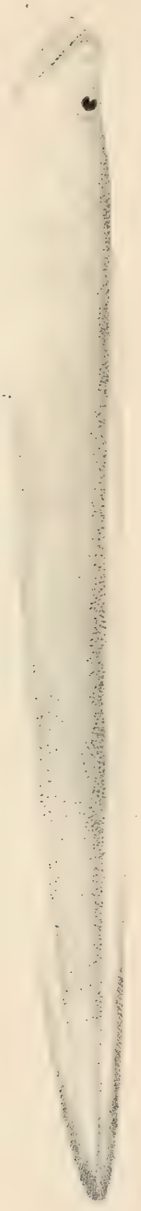
GILLELLUS SEMICINCTUS

Anna L. Brown del.

PLATE XXXIII.



DACTYLAGNUS MUNDUS



LYCODAPUS FIERASFER

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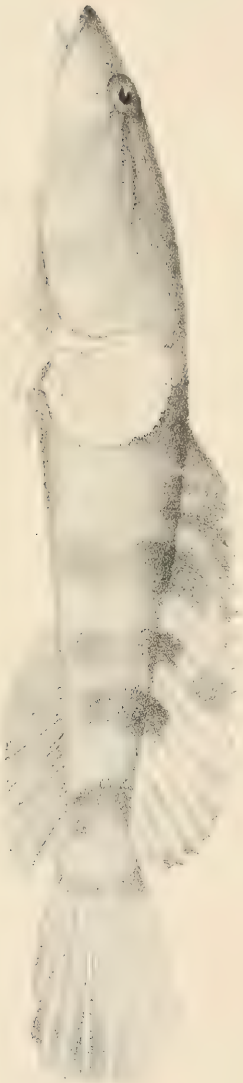

BRYSSETÆRES PINNIGER

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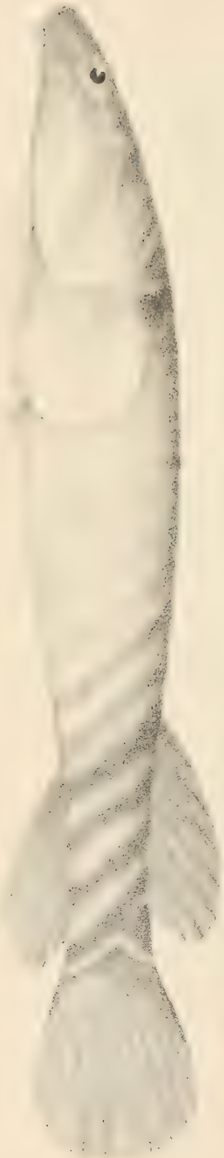
PLATE XXXV.



ARBACIOSA HUMERALIS

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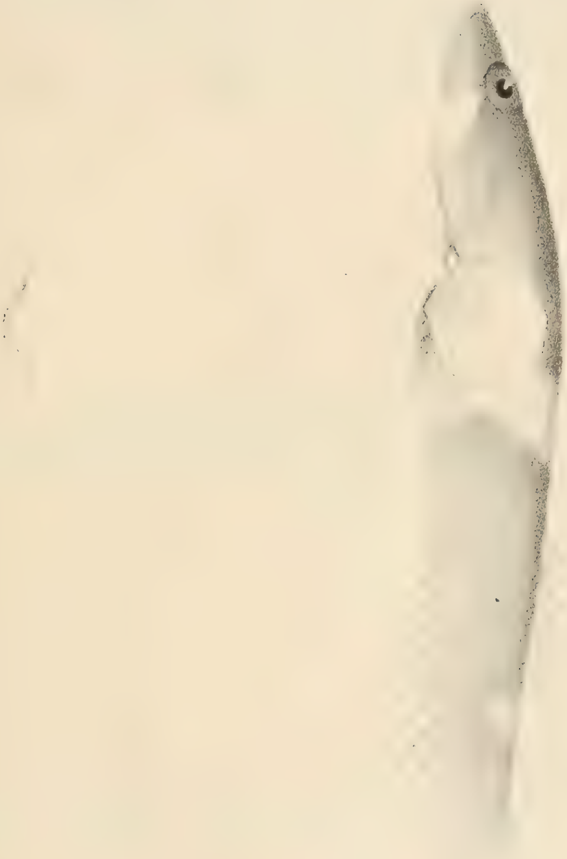

ARBACIOSA RHESSODON

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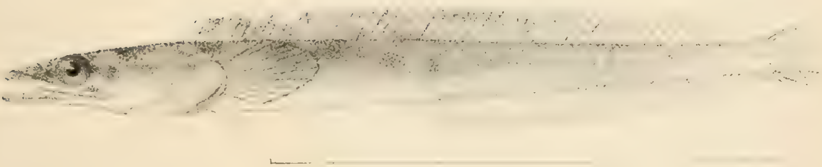
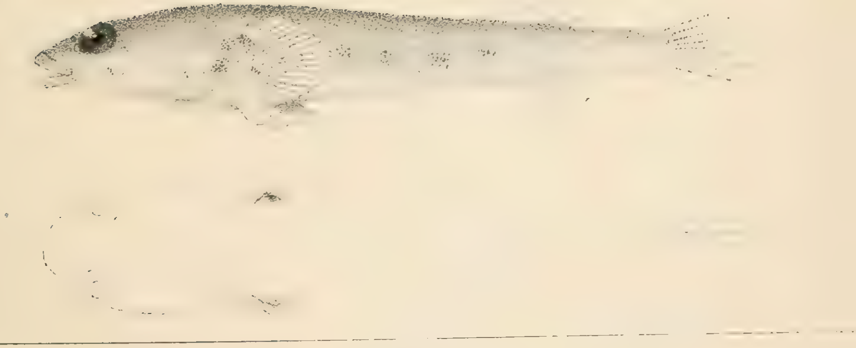
RUNULA AZALEA



LUCIOBLENNIUS ALEPIDOTUS



ARBACIOSA EOS

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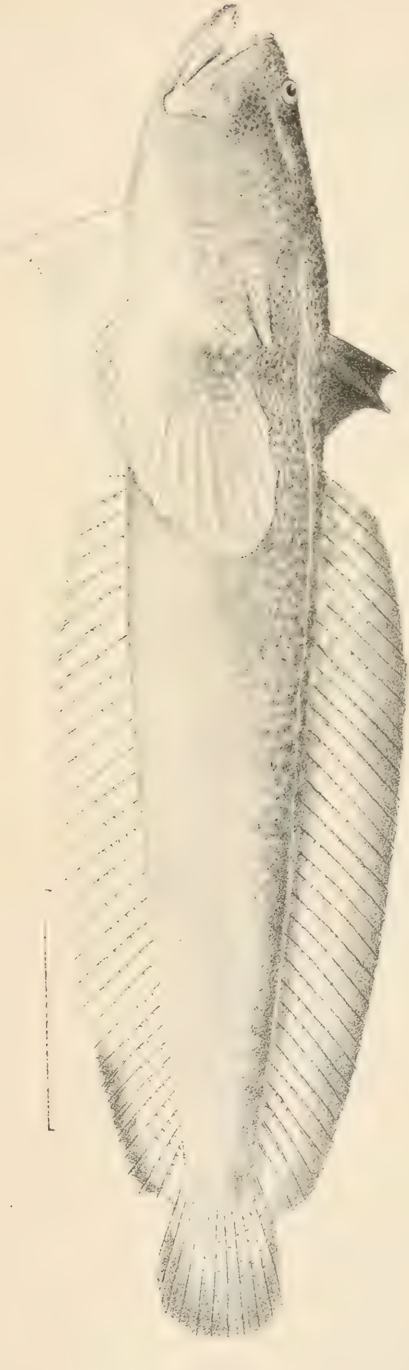
PLATE XXXVIII



THALASSOPHRYNE DOWI

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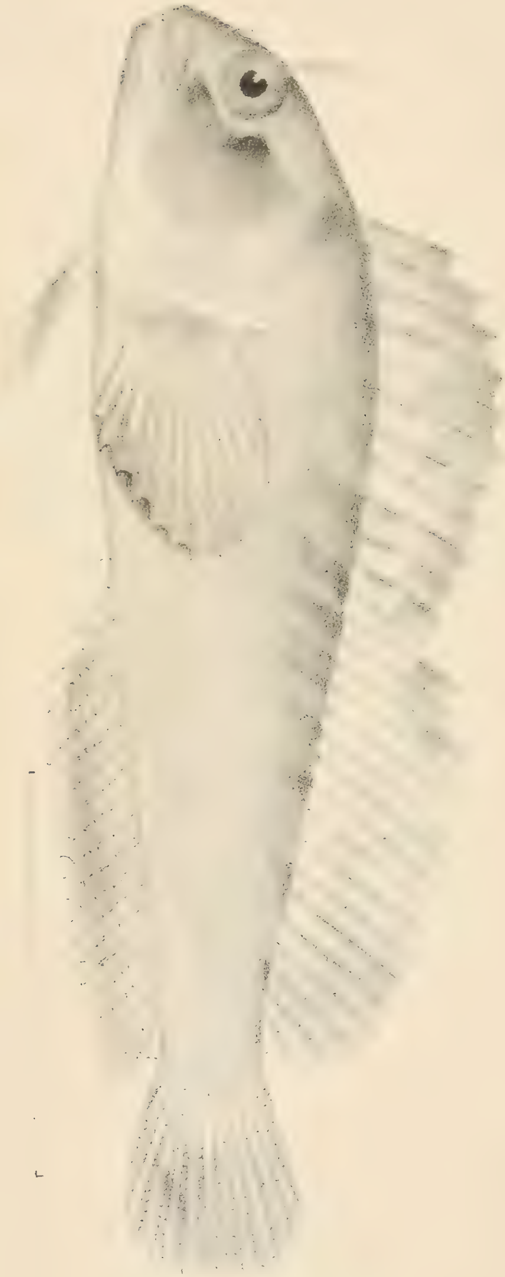

CHASMODES JENKINSI

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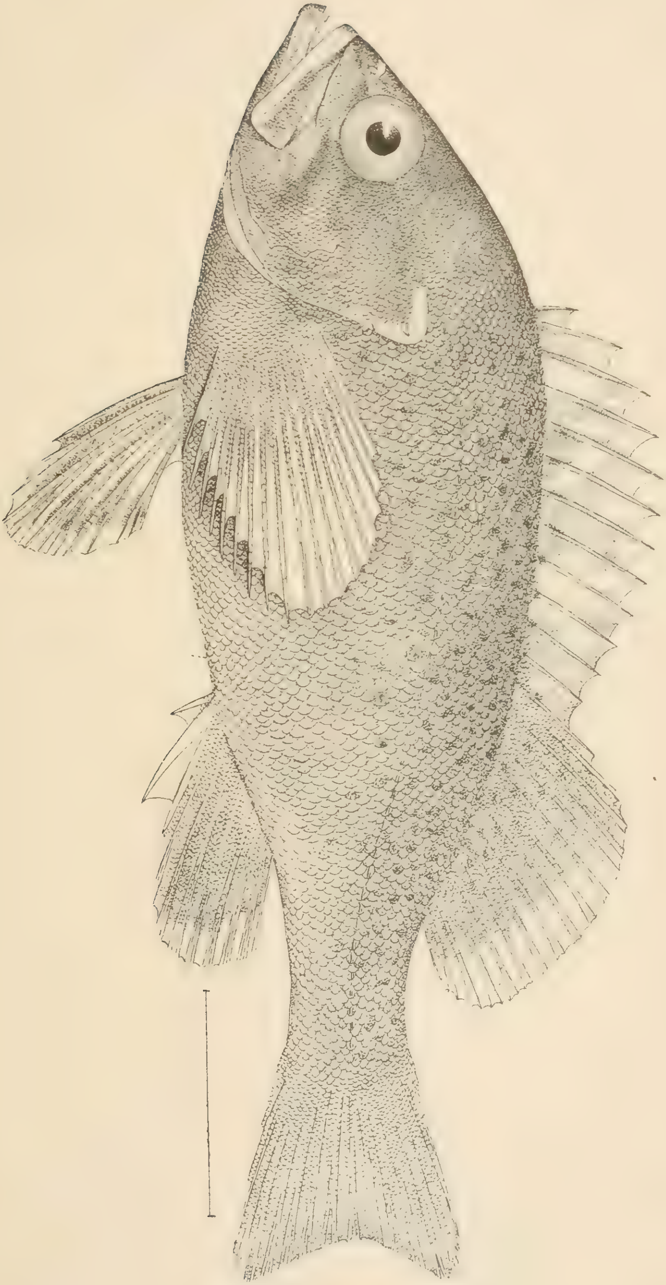
PLATE XL.



SEBASTODES CILIATUS

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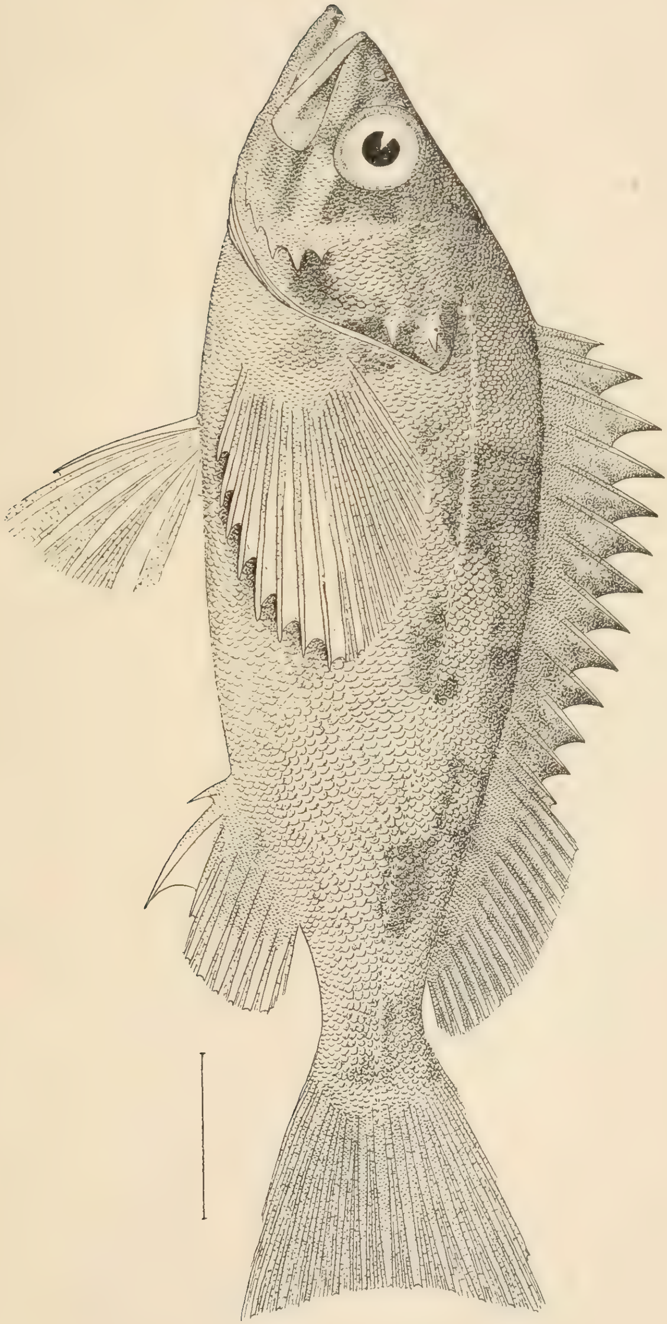

SEBASTODES HOPKINSI

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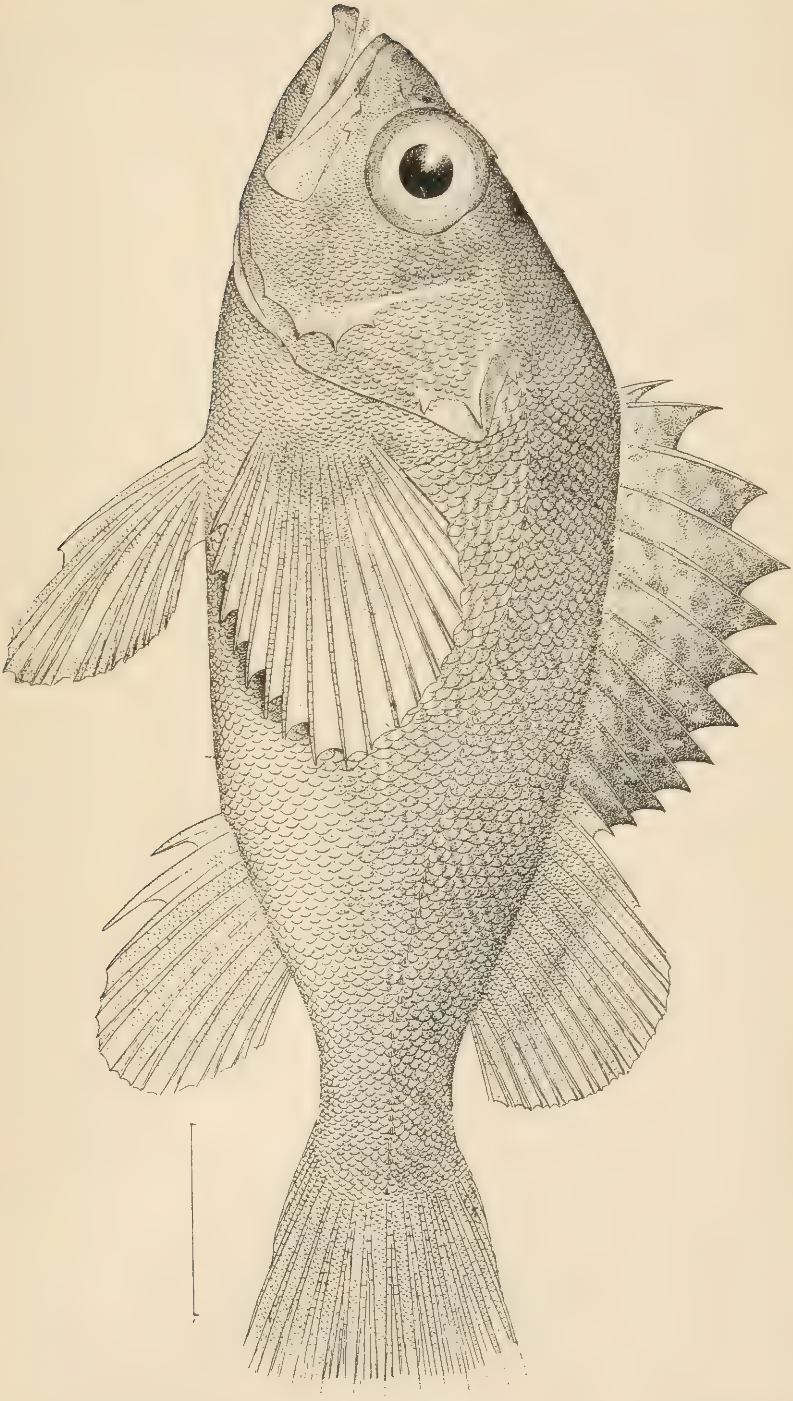
PLATE XLII



SEBASTODES EIGENMANNI

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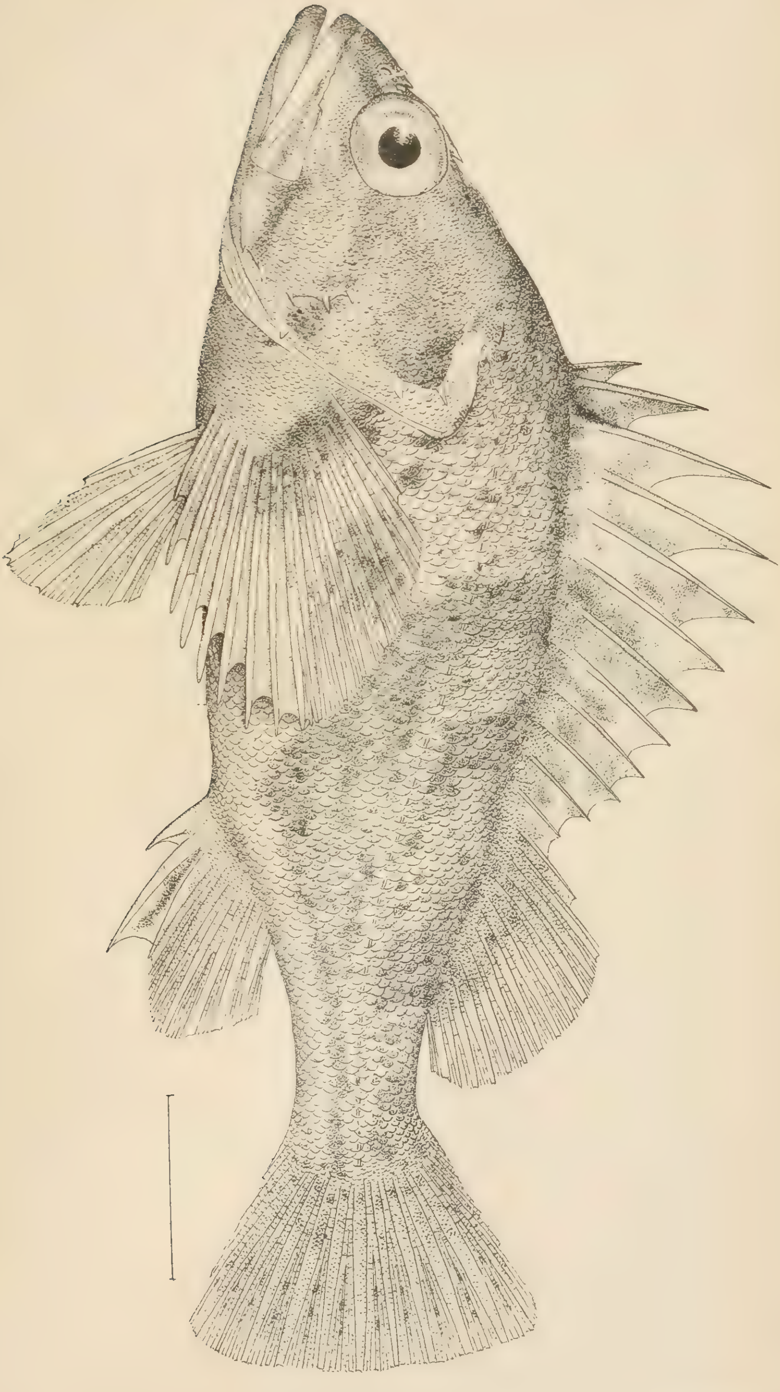
PLATE XLII



SEBASTODES GILBERTI

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